

**The Role of Business Intelligence in Supporting  
Sustainable Growth of E-Commerce  
Businesses in Jordan**

**Prepared by  
Khaled Ahmed Tayyem**

**Supervised by  
Dr. Ibrahim Abdelhameed Abu AlSondos**

**A Thesis Submitted In Partial Fulfillment Of The Requirements  
For The Master's Degree In E-Business**

**Department of E-Business  
Faculty of Business  
Middle East University  
January, 2026**

دور ذكاء الأعمال في دعم النمو المستدام للأعمال الإلكترونية  
في الأردن

إعداد  
خالد أحمد تيم

إشراف  
الدكتور إبراهيم عبد الحميد أبو السندس

قدمت هذه الرسالة استكمالاً لمتطلبات الحصول على درجة الماجستير  
في الأعمال الإلكترونية

قسم الأعمال الإلكترونية

كلية الأعمال

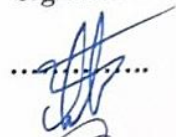
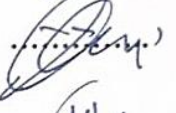
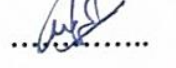

جامعة الشرق الأوسط

كانون الثاني، 2026

## Thesis Committee Decision

This thesis, titled **“The Role of Business Intelligence in Supporting Sustainable Growth of E-Commerce Businesses in Jordan”** by researcher **Khaled Ahmed Tayyem** and was successfully defended and approved on 19/01/2026.

### Examination Committee Members

Name	Title	Entity	Signature
Dr. Ibrahim Abdelhameed Abu AlSondos	Supervisor	Middle East University	
Prof.Dr. Ahmad Ali Salih	Internal Member and Committee Head	Middle East University	
Dr. Mohammad Al-Zoubi	Internal Member	Middle East University	
Dr. Husam Fakhri Ysseen	External Member	Al-Balqa' Applied University	

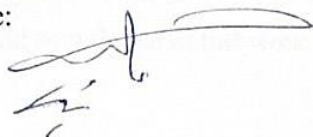
## Authorization

I, **Khaled Ahmed Tayyem**, authorize Middle East University to provide copies of my thesis on paper and electronically, in whole or in part, to libraries, organisations, bodies, and institutions concerned with scientific research and studies upon request.

Name: Khaled Ahmed Tayyem

Date: 19/01/2026.

Signature:

A handwritten signature in black ink, consisting of a series of loops and a long horizontal stroke, positioned to the right of the 'Signature:' label.

## **Acknowledgment**

I would like to begin by expressing my genuine gratitude to the Faculty of Business at Middle East University. Your guidance, encouragement and dedication have enriched my journey at the university and provided me with such knowledge and insights that I will carry with me throughout my professional career.

I am especially grateful and thankful to **Dr. Ibrahim Abdelhameed Abu AlSondos** for his mentorship that was valuable and meaningful during my thesis. His continued support, patience and guidance made a difference and played an important role in the successful completion of this work. I appreciate his commitment to my growth during this journey.

**Khaled Ahmed Tayyem**

## **Dedication**

To my beloved family,

I would not be here or have reached this milestone in my academic career without your endless love, support and words of encouragement and excitement with every goal I have reached on this journey. Your faith and believing in me has been a strong motivation for me to continue. You have given me strength to encounter every challenge that came my way. May Allah bless you with unwavering care and inspiration.

**Khaled Ahmed Tayyem**

## Table of Content

<b>Subject</b>	<b>Page</b>
Title .....	I
Thesis Committee Decision .....	II
Authorization .....	III
Acknowledgment .....	IV
Dedication .....	V
Table of Content .....	VI
List of Tables .....	VIII
List of Figures .....	IX
List of Appendices .....	XI
List of Abbreviations .....	XII
Abstract in English.....	XIII
Abstract in Arabic .....	XIV
<b>Chapter One: Background and Problem Statement</b>	
1.1 Introduction.....	1
1.2 Problem of the Study .....	3
1.3 Study Objective and Questions .....	4
1.4 Significance of the Study .....	5
1.5 Study Design.....	6
1.6 Study Model.....	6
1.7 Study Terminology .....	8
1.8 Study limitations .....	9
<b>Chapter Two: Theoretical Framework and Previous Studies</b>	
2.1 Definitions and components of variables.....	11
2.2 Components of BI systems .....	17
2.3 BI applications in e-business .....	24
2.4 Digital Transformation's Effect on Improving Business Performance .....	34
2.5 The role of big data and its analysis in decision support .....	39
2.6 Previous Studies.....	55
<b>Chapter Three: Study Methodology (Methods and Procedures)</b>	
3.1 Introduction.....	61
3.2 The Research Method .....	61

3.3 Study Population, Sample, and Unit of Analysis.....	61
3.4 Data Collection Methods .....	62
3.5 Research Instrument (The Questionnaire) .....	62
3.6 Validity and Reliability.....	63
3.7 Statistical Processing of Data .....	63
3.8 Ethical Considerations .....	63

#### **Chapter Four: Results of the Study**

4.1 Introduction.....	64
4.2 Descriptive Analysis of Study Variables .....	101
4.3 Multi-Regression Analysis .....	105
4.4 Recreation Test Style Analysis .....	105

#### **Chapter Five: Discussion of Findings and Recommendations**

5.1 Introduction.....	107
5.2 Main Findings .....	107
5.3 Conclusions.....	109
5.4 Research Recommendations .....	109
References.....	111
Appendices.....	119

### List of Tables

Chapter No.- Table No	Title	Page
4-1	Calculating the correlation ratio using Spearman correlation	78
4-2	Percentage of sample individuals by gender and age	64
4-3	Number and percentage of sample members by gender	65
4-4	Explaining the distribution of sample members according to academic qualification and gender	66
4-5	Distribution of the Study Sample According to Current Position / Role	67
4-6	Distribution of the Study Sample According to Years of Experience in E-Commerce	68
4-7	Distribution of the Study Sample According to Level of Involvement with Business Intelligence (BI)	69
4-8	Distribution of the Study Sample According to the Size of the E-Commerce Business	70
4-9	Responses to Statement (BII1)	72
4-10	Responses to Statement (BII2)	73
4-11	Responses to Statement (BII3)	74
4-12	Responses to Statement (BII4)	75
4-13	Responses to Statement (BII5)	76
4-14	Responses to Statement (DC1)	77
4-15	Responses to Statement (DC2)	78
4-16	Responses to Statement (DC3)	78
4-17	Responses to Statement (DC4)	79
4-18	Responses to Statement (DC5)	80
4-19	Responses to Statement (DQ1)	81
4-20	Responses to Statement (DQ2)	82
4-21	Responses to Statement (DQ3)	83
4-22	Responses to Statement (DQ4)	84
4-23	Responses to Statement (DQ5)	85
4-24	Responses to Statement (DI1)	86
4-25	Responses to Statement (DI2)	87
4-26	Responses to Statement (DI3)	88
4-27	Responses to Statement (DI4)	89
4-28	Responses to Statement (DI5)	90
4-29	Responses to Statement (DM1)	91
4-30	Responses to Statement (DM2)	92
4-31	Responses to Statement (DM3)	93
4-32	Responses to Statement (DM4)	94
4-33	Responses to Statement (DM5)	95
4-34	Responses to Statement (SGC1)	96
4-35	Responses to Statement (SGC2)	97
4-36	Responses to Statement (SGC3)	98
4-37	Responses to Statement (SGC4)	99
4-38	Responses to Statement (SGC5)	100

## List of Figures

Chapter No.- Figure No	Title	Page
1-1	The researcher obtained the variables for the study model from the following sources: (Al-Negrish & Almomani, 2024; Ismaeel, Alali, Injadat, & Al-Haraizah, 2021; Al-Bazaiah, 2022; Qatawneh, Alkhasawneh, & Althonayan, 2023; Rawash, 2021; Abu-AIS	7
2-1	Business Intelligence Processing	25
2-2	e-Service distributed architecture	27
2-3	Applying OIKI DDM to storefront e-business model	30
2-4	DTI's Adoption Ladder	32
2-5	The Theoretical Framework of the study	37
2-6	Integrated model of the decision-making process	42
4-1	Percentage of sample individuals by gender and age	65
4-2	Number and percentage of sample members by gender	66
4-3	Explaining the distribution of sample members according to academic qualification and gender	67
4-4	Distribution of the Study Sample According to Current Position / Role	68
4-5	Distribution of the Study Sample According to Years of Experience in E-Commerce	69
4-6	Distribution of the Study Sample According to Level of Involvement with Business Intelligence (BI)	70
4-7	Distribution of the Study Sample According to the Size of the E-Commerce Business	71
4-8	Responses to Statement (BII1)	72
4-9	Responses to Statement (BII2)	73
4-10	Responses to Statement (BII3)	74
4-11	Responses to Statement (BII4)	75
4-12	Responses to Statement (BII5)	76
4-13	Responses to Statement (DC1)	77
4-14	Responses to Statement (DC2)	78
4-15	Responses to Statement (DC3)	79
4-16	Responses to Statement (DC4)	80
4-17	Responses to Statement (DC5)	81
4-18	Responses to Statement (DQ1)	82
4-19	Responses to Statement (DQ2)	83
4-20	Responses to Statement (DQ3)	84
4-21	Responses to Statement (DQ4)	85
4-22	Responses to Statement (DQ5)	86
4-23	Responses to Statement (DI1)	87
4-24	Responses to Statement (DI2)	88
4-25	Responses to Statement (DI3)	89
4-26	Responses to Statement (DI4)	90
4-27	Responses to Statement (DI5)	91
4-28	Responses to Statement (DM1)	92

<b>Chapter No.- Figure No</b>	<b>Title</b>	<b>Page</b>
4-29	Responses to Statement (DM2)	93
4-30	Responses to Statement (DM3)	94
4-31	Responses to Statement (DM4)	95
4-32	Responses to Statement (DM5)	96
4-33	Responses to Statement (SGC1)	97
4-34	Responses to Statement (SGC2)	98
4-35	Responses to Statement (SGC3)	99
4-36	Responses to Statement (SGC4)	100
4-37	Responses to Statement (SGC5)	101

## List of Appendices

No.	Title	Page
1	Questionnaire Form	119
2	Calculating the correlation ratio using Spearman correlation	126
2	list of arbitrators	131

### List of Abbreviations

No	Abbreviation	Explanation
1	BI	Business Intelligence
2	BDA	Big Data Analytics
3	OLAP	Online Analytical Processing
4	ERP	Enterprise Resource Planning
5	SaaS	Software as a Service
6	SCM	Supply Chain Management
7	DM	Data Mining
8	BI&DM	Business Intelligence-driven Data Mining
9	SEMMA	Sample, Explore, Modify, Model, and Assess
10	CRM	Customer Relationship Management
11	CRISP-DM	Cross-industry standard process for Data Mining
12	SDGs	Sustainable Development Goals
13	GKM	Green Knowledge Management
14	SCI	Supply Chain Integration
15	GSCM	Green Supply Chain Management
16	GTI	Green Technology Innovation
17	SE	Sustainable Entrepreneurship
18	ROI	Return On Investment
19	EP	Environmental Performance
20	BCI	Blockchain Integration
21	BD	Big Data
22	GSCM	Green Supply Chain Management
23	TOE	Technology, Organization, and Environment

# **The Role of Business Intelligence in Supporting Sustainable Growth of E-Commerce Businesses in Jordan**

**Prepared by**

**Khaled Ahmed Tayyem**

**Supervised by**

**Dr. Ibrahim Abdelhameed Abu AlSondos**

## **Abstract**

This study examines the role of Business Intelligence (BI) in fostering the sustainable growth of Jordan's e-commerce sector amidst challenges such as intense competition, shifting consumer preferences, and the increasing demand for rapid, data-driven decision-making.

BI encompasses a set of tools and processes for collecting, analyzing, and utilizing data, enabling businesses to monitor sales, optimize inventory management, enhance the quality of decision-making, and improve overall operational efficiency.

Empirical evidence indicates that the adoption of BI within Jordanian small and medium-sized enterprises (SMEs) strengthens competitive advantage, reduces operating costs, enhances supply chain performance, and increases customer satisfaction.

The findings reveal that BI tools—including dashboards, data warehouses, and analytics platforms—are widely implemented, particularly in marketing, supply chain management, and customer relationship management (CRM).

Between 66% and 70% of respondents reported that BI tools significantly improved their decision-making capabilities, operational efficiency, and ability to achieve sustainable growth.

Key recommendations include expanding BI adoption across organizational departments, investing in advanced BI technologies, providing continuous training, ensuring data accuracy, securing strong managerial support, aligning BI initiatives with sustainability strategies, fostering cross-functional collaboration, and cultivating a data-driven organizational culture.

Overall, the study concludes that effective deployment of BI enables Jordanian e-commerce businesses to make informed strategic decisions, capitalize on growth opportunities, and achieve long-term sustainability in a dynamic and competitive digital economy.

**Keywords:** Business Intelligence (BI), Data Quality, Data Integration, Data Mining, E-Commerce, SMEs, CRM, Supply Chain, Sustainable Growth, Jordan.

## دور ذكاء الأعمال في دعم النمو المستدام للأعمال الإلكترونية في الأردن

الإعداد

إشراف:

د. إبراهيم عبدالحميد أبو السندس

الملخص

تبحث هذه الدراسة في دور ذكاء الأعمال (BI) في تعزيز النمو المستدام لقطاع الأعمال الإلكترونية في الأردن، وذلك في ظل التحديات المتمثلة في: "المنافسة الشديدة، وتغير تفضيلات المستهلكين، والطلب المتزايد على اتخاذ قرارات سريعة قائمة على البيانات".

يشمل ذكاء الأعمال مجموعة من الأدوات والعمليات الخاصة بجمع البيانات وتحليلها واستخدامها، ما يمكّن الشركات من متابعة المبيعات، تحسين إدارة المخزون، رفع جودة القرارات، وتعزيز الكفاءة التشغيلية بشكل عام.

تشير الأدلة التجريبية إلى أن تبني ذكاء الأعمال في الشركات الصغيرة والمتوسطة الأردنية يعزز الميزة التنافسية، ويقلل من تكاليف التشغيل، كما يحسن أداء سلسلة الإمداد، ويرفع مستوى رضا العملاء.

وتبين النتائج أن أدوات ذكاء الأعمال – مثل لوحات المعلومات، مستودعات البيانات، ومنصات التحليلات – تُستخدم على نطاق واسع، خصوصاً في مجالات التسويق، وإدارة سلسلة الإمداد، وإدارة علاقات العملاء (CRM).

وقد أفاد ما بين 66% و70% من المشاركين بأن استخدام أدوات ذكاء الأعمال ساهم بشكل ملموس في تحسين قدرتهم على اتخاذ القرارات، ورفع الكفاءة التشغيلية، وتحقيق النمو المستدام.

توصي الدراسة بتوسيع تطبيق ذكاء الأعمال من خلال: "الاستثمار في تقنيات متقدمة، توفير تدريب مستمر، ضمان دقة البيانات، تعزيز دعم الإدارة العليا، مواءمة مبادرات ذكاء الأعمال مع استراتيجيات الاستدامة، تشجيع التعاون بين الأقسام، وبناء ثقافة مؤسسية قائمة على البيانات".

خلصت الدراسة إلى أن التطبيق الفعال لذكاء الأعمال يمكّن شركات الأعمال الإلكترونية الأردنية من اتخاذ قرارات استراتيجية مدروسة، واستثمار فرص التوسع، وتحقيق الاستدامة طويلة المدى في اقتصاد رقمي ديناميكي وتنافسي.

**الكلمات المفتاحية:** ذكاء الأعمال (BI)، جودة البيانات، تكامل البيانات، التنقيب في البيانات، الأعمال الإلكترونية، الشركات الصغيرة والمتوسطة، إدارة علاقات العملاء (CRM)، سلسلة الإمداد، النمو المستدام، الأردن.

# Chapter One

## Background and Problem Statement

### 1.1 Introduction

The e-commerce sector in Jordan has witnessed a rapid growth in the past couple of years. That created lots of new opportunities for companies to reach out to customers via the internet. This fast growth has come with lots of challenges, such as increased competition, changed customer behavior and the need to take faster and smarter decisions. To compete and achieve sustainable growth many companies have started adopting Business Intelligence (BI) into their business.

Business Intelligence is the tools and processes that help companies to collect, analyze and use data to improve their performance and have a better decision-making process (Verma & Sharma, 2021). In the e-commerce environment, BI plays a crucial role in understanding customer behavior, analyze and track sales, improve storage management and measure the performance of marketing campaigns (Ferreira et al., 2019). For example, BI tools could help online businesses to know the reason behind why the customers have abandoned their cart or even know their best-selling products, which helps in better decision-making process regarding the marketing campaign to be implemented which will eventually lead to better sales and satisfied customers (Verma & Sharma, 2021).

In the context of the Jordanian market, specially between SMEs, adopting BI tools and processes could be critical to achieve excellence and sustainability. Recent studies showed that BI helps to achieve operational performance, the decision-making quality, and better response to the changing market (Lutfi et al., 2022). It also contributes to having lower operational costs and improving the overall performance, which makes it an important factor in achieving sustainable growth.

Many studies have proved and shown the positive impact that companies gain by implementing BI and use it accurately. For example, Ahmad Arikat (2024) study showed that BI contributed to enhancing the performance of supply chain in Jordanian companies through improving integration, flexibility and responsiveness. Additionally, Ferreira et al. (2019) study showed that the integration between BI and e-commerce helped

companies in analyzing customers' behavior, improving inventory management and increasing competitiveness.

In addition to operational improvements, BI contributes to increasing companies' readiness to make decisions based on accurate performance indicators such as conversion rate, browsing behavior, and seasonal buying patterns, supporting sustainable marketing and investment plans (Verma & Sharma, 2021; Ferreira et al., 2019). The ability to use predictive analytics and real-time reporting helps companies reduce risk and maximize growth opportunities, which is crucial in an ever-changing business environment.

As the Jordanian digital economy is continuously growing, the need to understand how BI could support sustainable growth in the e-commerce sector becomes important. This study aims to study Business Intelligence role in supporting and promoting sustainable growth of e-commerce companies in Jordan. By focusing on its dimensions related to making accurate decision-making, increased customer satisfaction, improving operational performance and increase in sales.

To assess the sustainable growth of e-commerce companies in Jordan, this study will employ a longitudinal analysis over specific time intervals. The study will track key performance indicators such as Sales Growth Rate, Market Expansion, Repeat Purchases, Customer Confidence, and Operational Efficiency across multiple time points. This temporal analysis will allow for observing growth trends, identifying stability or fluctuation patterns, and examining how BI-driven decisions contribute to maintaining or accelerating sustainable growth. By comparing performance over quarterly and annual timelines, the study aims to highlight not only immediate impacts but also the long-term effects of BI adoption on the sustainability of e-commerce businesses in Jordan.

As the Jordanian digital economy continues to grow, understanding how BI can support sustainable growth in the e-commerce sector becomes increasingly significant. This study aims to explore the role of Business Intelligence in supporting and promoting the sustainable growth of e-commerce companies in Jordan by focusing on its dimensions related to accurate decision-making, increased customer satisfaction, improved operational performance, and enhanced sales outcomes.

## 1.2 Problem of the Study

Despite the rapid and continuous expansion of the e-commerce sector in Jordan, many companies—particularly small and medium-sized enterprises (SMEs)—continue to face significant challenges in sustaining long-term growth.

Symptoms of this problem include evolving consumer behaviors, intensified market competition, and the pressing need for real-time, data-driven decision-making, all of which add complexity to business operations (Al Dawoud, 2024).

Research further indicates that Jordanian SMEs often struggle with limited financial resources, insufficient digital literacy, and the absence of structured digital marketing strategies, which restrict their ability to leverage digital platforms effectively for growth (Al Dawoud, 2024).

In addition, weak digital infrastructure and the slow adoption of business intelligence tools exacerbate these difficulties, making sustainable growth even harder to achieve (Al-Negrish & Almomani, 2024).

Business Intelligence (BI) has emerged as a critical tool for companies seeking deeper insights into customer behavior, improved performance analysis, and enhanced operational efficiency.

However, the implementation of BI tools and processes in the Jordanian market remains limited and underutilized, due to a lack of awareness of their importance, inadequate infrastructure, and the absence of clear integration strategies between BI and e-commerce (Lutfi et al., 2022; Ahmad Arikat, 2024).

While recent studies demonstrate that BI can significantly support sustainable growth by improving decision-making, strengthening customer engagement, reducing operational inefficiencies, and increasing revenue (Verma & Sharma, 2021; Ferreira et al., 2019), there is still a notable research gap.

Specifically, little attention has been given to the role of BI in enabling sustainable growth within Jordan's e-commerce sector, particularly among SMEs that form the backbone of the national economy.

This study addresses that gap by focusing on SMEs in Jordan's e-commerce industry, which were selected because they are both economically vital and highly vulnerable to the challenges of limited resources and digital adaptation.

The novelty of this research lies in its attempt to empirically link BI components—data collection, data quality, data integration, and data mining—with indicators of sustainable growth in the Jordanian e-commerce context.

By doing so, the study contributes new insights to the academic literature and offers practical guidance for SMEs seeking to achieve long-term viability in a competitive digital economy.

### **1.3 Study Objective and Questions**

Study objectives can be summarized in the following:

#### **1.3.1 Main Objective:**

To examine the role of Business Intelligence (BI) in supporting the sustainable growth of e-commerce businesses in Jordan.

#### **1.3.2 Sub-Objectives:**

1. To evaluate the impact of Data Collection on achieving sustainable growth in Jordanian e-commerce.
2. To investigate how Data Quality influences decision-making for long-term business sustainability.
3. To assess the contribution of Data Integration across departments to organizational growth.
4. To analyze the effectiveness of Data Mining in identifying patterns that foster expansion and competitiveness.

#### **1.3.3 Main Research Question**

What is the overall impact of Business Intelligence (BI) components on the sustainable growth of e-commerce businesses in Jordan?

### **1.3.4 Sub-questions**

- How does systematic data collection contribute to the expansion and sustainability of e-commerce activities in Jordan?
- To what extent does data quality enhance the reliability of strategic decision-making for long-term business success?
- In what ways does data integration across departments improve operational efficiency and organizational coordination to support sustainable growth?
- How effective is data mining in identifying patterns that enable managerial decisions fostering market expansion and competitiveness?

## **1.4 Significance of the Study**

### **1.4.1 Theoretical and Scientific Significance**

This study is considered important due to the theoretical scope because it focuses on the relationship between business intelligence and sustainable growth in the e-commerce sector specifically in the Jordanian market. This is a scope that has not been studied about enough, this study provides a model that shows how BI tools could improve the performance of companies, through making better decisions, increased customer satisfaction and less costs (Abu-AlSondos, 2023; Tavera Romero et al., 2021).

This study also enhances the scientific understanding of the role of BI in companies that works in the e-commerce sector, It also could open up to new study papers that could be built on the findings and data of a Jordanian market, This study adds value to the academic literature that most of the times focuses on different markets other that the Jordanian one that is often ignored.

### **1.4.2 Practical and Strategic Significance**

This study provides a real value to Jordanian companies, especially ones operating in the e-commerce sector, because it helps them to understand how BI tools and adoption could makes a real difference in the company's performance and growth. From results, decision makers could create and develop new ways to analyze customer data, improve marketing plans, and manage inventory more efficiently.

Additionally, this study provides a clear result that the usage of BI help companies in responding effectively to the rapid changes in the market, and making decisions built on reliable real data, which supports the company success and long-term growth.

## 1.5 Study Design

### Main Hypotheses

**H1:** Business Intelligence components (data collection, quality, integration, and mining) collectively have a significant positive impact on the sustainable growth of e-commerce businesses in Jordan.

### Sub-Hypothesis

**H1a:** There is a statistically significant impact of **Data Collection** on sustainable growth.

**H1b:** There is a statistically significant impact of **Data Quality** on sustainable growth.

**H1c:** There is a statistically significant impact of **Data Integration** on sustainable growth.

**H1d:** There is a statistically significant impact of **Data Mining** on sustainable growth.

## 1.6 Study Model

The conceptual framework of this study is grounded in established theoretical models, particularly the Technology Acceptance Model (TAM) and the Technology–Organization–Environment (TOE) framework, TAM provides a foundation for understanding how perceived usefulness and ease of use influence the adoption of technological systems such as Business Intelligence (BI).

TOE complements this by emphasizing the role of organizational context and external environment in shaping technology integration.

These theories collectively justify the inclusion of specific BI components—data collection, data quality, data integration, and data mining—as critical determinants of sustainable growth in e-commerce enterprises.

Drawing on a comprehensive review of prior studies (Al-Negrish & Almomani, 2024; Ismaeel et al., 2021; Al-Bazaiah, 2022; Qatawneh et al., 2023; Rawash, 2021; Abu-

AlSondos, 2023), the researcher developed a model that captures the direct relationships between BI practices and the sustainable growth of e-commerce businesses in Jordan. Unlike some previous models, this framework excludes mediating variables to maintain analytical focus and clarity.

The dependent variable—sustainable growth—was selected based on empirical observations of BI adoption in Jordanian SMEs and expert consultations.

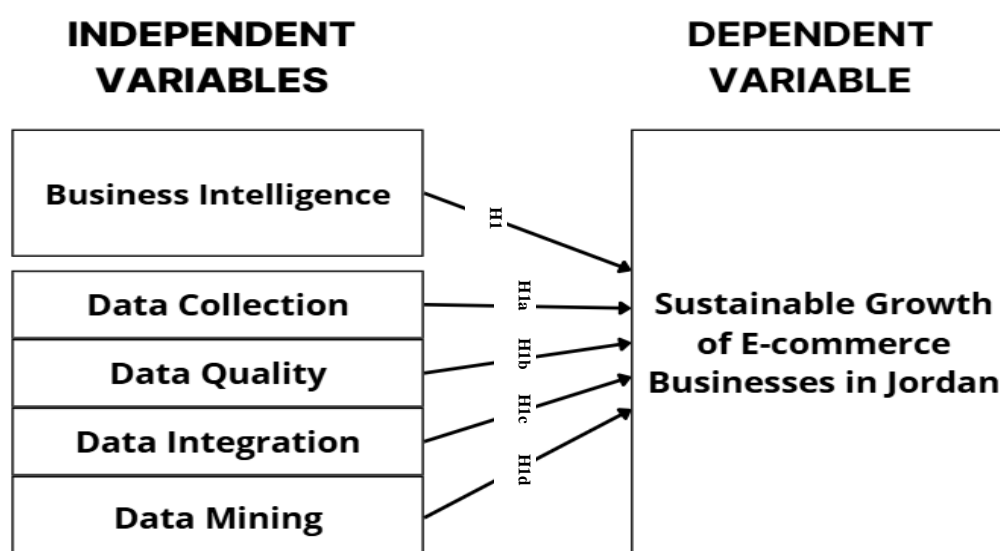
It is operationalized through key performance indicators such as sales growth, market expansion, customer retention, brand trust, and operational efficiency.

The independent variables represent core BI functions that, according to both TAM and TOE, are expected to influence organizational outcomes when effectively implemented.

The new research model explicitly reflects these theoretical underpinnings.

Each BI component is hypothesized to have a direct impact on sustainable growth, as illustrated in the conceptual diagram.

The model also includes a collective hypothesis (H1) that evaluates the overall contribution of BI to long-term business viability in the e-commerce sector.



**Figure 1-1**The researcher obtained the variables for the study model from the following sources: (Al-Negrish & Almomani, 2024; Ismael, Alali, Injadat, & Al-Haraizah, 2021; Al-Bazaiah, 2022; Qatawneh, Alkhasawneh, & Althonayan, 2023; Rawash, 2021; Abu-AIS

## 1.7 Study Terminology

- **Business Intelligence (BI):** A structured set of tools, technologies, and processes that enable organizations to collect, analyze, and utilize data to improve decision-making and enhance overall performance.
- **E-Commerce:** The exchange of goods and services through digital platforms, involving the transfer of information over the Internet, It allows transactions to occur without temporal or geographic constraints and has witnessed rapid expansion in recent years (Ferreira, Pedrosa, & Bernardino, 2019).
- **Operational Efficiency:** The organization's ability to maximize output while minimizing waste and cost, achieved through optimized resource allocation and streamlined business processes (Abu-ALSondos et al., 2024).
- **Customer Analytics:** The use of data analysis techniques to understand customer behavior, forecast future actions, and inform strategic decisions in marketing and service delivery (Verma & Sharma, 2021).
- **Marketing Performance Tracking:** A systematic approach to measuring and analyzing marketing activities and their outcomes, It involves monitoring campaign effectiveness, sales performance, and customer engagement to guide future strategies (Verma & Sharma, 2021).
- **Sustainable Growth:** The capacity of a business to expand and increase profitability while minimizing environmental impact and preserving resources for future generations (Khan, Mehmood, & Kwan, 2024).
- **Data Collection:** The systematic gathering of observations or measurements using various techniques to understand phenomena, answer research questions, and test hypotheses. It serves as a foundation for informed decision-making (Ahmad Arikat, 2024).
- **Data Quality:** The extent to which data is accurate, complete, reliable, and relevant to business needs, High-quality data ensures trustworthy insights and supports effective strategic decisions (Abu-ALSondos, 2023).
- **Data Integration:** The process of consolidating data from multiple sources to create a unified view, thereby enhancing connectivity across business functions and improving operational performance (Al-Negrish & Almomani, 2024).

- **Data Mining:** The analytical process of exploring large datasets to uncover patterns, trends, and actionable insights that support strategic planning and decision-making (Al-Negrish & Almomani, 2024).

## 1.8 Study limitations

This research acknowledges several limitations that may influence the interpretation and generalization of its findings:

First, the study is restricted to e-commerce companies in Jordan, which means the results may not be directly applicable to markets operating under different technological, legal, or economic conditions.

Second, although efforts were made to ensure reliability, the study relies on self-reported data from firms, which may be subject to response bias or inaccuracies.

Third, external factors such as technological disruptions, economic volatility, or sudden shifts in market dynamics were not included in the analysis, even though they may affect the observed relationships between Business Intelligence (BI) components and sustainable growth.

Moreover, the study focuses exclusively on four BI components—data collection, data quality, data integration, and data mining—without considering other BI practices or emerging technologies that could also influence growth outcomes.

The scope was deliberately narrowed to small and medium-sized e-commerce enterprises (SMEs) in Jordan, as these firms are both economically significant and particularly vulnerable to challenges related to limited resources and digital adaptation.

While this focus strengthens the relevance of the study to a critical segment of the Jordanian economy, it also excludes other potential determinants of sustainable growth, such as marketing strategies, financial investment approaches, or human resource management practices.

Additionally, the study adopts a quantitative design, testing hypotheses through statistical analysis, while qualitative methods such as interviews or case studies were not employed.

These boundaries, while acknowledged, provide a clear and manageable scope for the research.

They also highlight opportunities for future studies to expand the model, incorporate additional variables, and employ mixed-method approaches to gain a more comprehensive understanding of how BI adoption contributes to sustainable development in diverse contexts.

## **Chapter Two**

### **Theoretical Framework and Previous Studies**

This chapter focuses on two main areas. The first part starts with the definitions of dependent and independent variables, along with components of variables. After that, the second part will focus on conclusions and findings from the reviewed previous studies, this study is distinguished by its focus on Jordan's e-commerce sector and its emphasis on how business intelligence directly supports sustainable growth and key performance indicators, unlike other studies that are broader or include mediating variables.

#### **2.1 Definitions and components of variables**

##### **Conceptual Definitions of Keywords**

- **Business Intelligence (BI):** Collection of tools and technologies that help businesses to collect and analyze data and use to make better decisions and enhance their performance.
- **Data Collection:** the systematic process of gathering observations or measurements to understand a phenomenon, answer study questions, and test hypotheses. It involves the use of various techniques to gather information that can be analyzed to support decision-making processes (The Role of Business Intelligence in Enhancing the Performance of Supply Chains in Jordan, Ahmad Arikat, 2024).
- **Data Quality:** the degree to which data is accurate, complete, reliable, and relevant to the needs of the business. High data quality ensures that the insights drawn from analytics are trustworthy and can support effective decision-making processes (The Impact of BIS on Quality of Strategic Decision-Making, Abu-ALSondos, 2023).
- **Data Integration:** The process of combining data from different sources to provide a unified view, enhancing business process connectivity and improving operational efficiency (Al-Negrish & Almomani, 2024).
- **Data Mining:** The process of analyzing large datasets to extract useful information and patterns, which supports decision-making and strategic planning in business environments (Al-Negrish & Almomani, 2024)

- **Sustainable Growth:** the ability of businesses to expand and increase profitability while minimizing their impact on the environment and maintaining the availability of natural resources for future generations (Green Knowledge Management: A Key Driver of Green Technology Innovation and Sustainable Performance, Khan, Mehmood, & Kwan, 2024).

### **Business Intelligence:**

In today's data-rich and technologically dynamic environment, e-businesses face growing challenges in understanding consumer behavior, optimizing internal operations, and identifying market opportunities.

Business Intelligence (BI) has emerged as a vital solution, enabling organizations to transform unstructured data into actionable insights that support strategic planning and informed decision-making.

BI encompasses a set of processes, tools, and technologies designed to collect, integrate, analyze, and visualize business data, offering not only retrospective analysis but also predictive and prescriptive capabilities.

Its relevance is particularly pronounced in e-commerce, where digital transactions generate vast amounts of data.

BI empowers e-businesses to monitor customer preferences, evaluate marketing effectiveness, enhance supply chain performance, and improve operational efficiency. Additionally, it aids in identifying new opportunities, mitigating risks, and managing resources more effectively—contributing to sustainable development. Fundamentally, BI is the cornerstone of data-driven decision-making in e-business, enhancing competitiveness and agility in response to evolving market and technological conditions. Understanding its strategic value is essential for any e-commerce enterprise aiming for long-term success and sustainability.

### **Definition of Business Intelligence:**

Business Intelligence (BI) is regarded as a vital tool that enables businesses to collect and analyze data in advanced ways, enhancing decision-making and operational performance. BI applications have become essential in e-commerce, helping firms

understand customer behavior, improve efficiency, and strengthen marketing strategies, thereby contributing to sustainable growth (Verma & Sharma, 2021).

The term “intelligence” in BI has two distinct meanings: one relates to human intelligence in business operations, while another refers to artificial intelligence technologies and cognitive abilities explored in the emerging field of “intellect of business” .

Researchers differ in their use of the phrase “business intelligence,” with some equating it to competitive intelligence or marketing research, others to internal reporting, and some distinguishing between public intelligence (focused on governmental or regional issues) and private intelligence (related to commercial and non-profit practices) (Bamerni, 2023).

Competitive intelligence is considered a subset of BI, focusing solely on the external competitive environment and rival activities, with little attention to internal data.

In contrast, BI broadly emphasizes the use of empirical data to support decisions across diverse domains such as companies, hospitals, or universities.

Decision support can range from operational assistance to strategic guidance at the highest organizational level. A wide array of models and analytical techniques—including reporting, data warehousing, data mining, process mining, predictive analytics, organizational mining, and text mining—are encompassed under the umbrella of BI (Grossmann & Rinderle-Ma, 2015).

One of the earliest references to the term business intelligence (BI) is found in H.P. Luhn’s 1958 work, where BI was defined as an automated system designed to distribute information across organizational departments.

Luhn described “intelligence” as the ability to connect facts in ways that guide purposeful action, while “business” encompassed diverse activities such as science, commerce, industry, and government.

His system aimed to condense documents and deliver relevant information to decision points.

Although this definition took decades to gain acceptance, BI was later reintroduced as a broad term for techniques and procedures that enhance decision-making through fact-based

technologies. Since then, multiple definitions have emerged, but most emphasize BI as an integrated, technology-driven, organization-specific strategy that provides actionable information in the right format, time, and place (Grossmann & Rinderle-Ma, 2015).

The growing complexity of business operations—driven by globalization, deregulation, mergers, competition, and technological innovation—has made it harder for managers to fully grasp their environments.

Consequently, many large firms adopted BI techniques to gain competitive advantage by improving the quality and timeliness of information and understanding their position relative to rivals.

BI tools allow businesses to analyze market share trends, customer behavior, preferences, capabilities, and conditions, helping managers anticipate changes and respond strategically (Khan & Quadri, 2012).

BI is essentially the process of gathering, evaluating, and presenting data to support informed and practical decisions.

It transforms unstructured data into insights about consumer behavior, market trends, operational efficiency, and competitive positioning.

In the context of e-commerce, BI plays a critical role in promoting sustainable growth by optimizing strategies, enhancing customer experience, and improving efficiency.

Tools such as Microsoft Power BI, Tableau, QlikSense, and programming platforms like Python, R, and D3.js provide timely insights for performance management and strategic planning.

E-commerce firms can leverage BI to identify high-performing products, predict consumer needs, target marketing campaigns, and achieve long-term sustainable growth in competitive online markets (Sherif, 2016).

Business Intelligence (BI) is a comprehensive process that transforms raw, unstructured data into meaningful and actionable insights to support well-informed decision-making. It goes beyond data collection to include systematic analysis, interpretation, and distribution, serving both strategic and operational objectives.

BI integrates external information—such as customer behavior, market trends, competitor strategies, technological developments, and broader economic or environmental factors—with internal data like performance metrics, resource utilization, employee expertise, and organizational capabilities.

By combining these sources, businesses gain a holistic view of strengths, weaknesses, opportunities, and threats, enabling them to anticipate market changes, adapt to evolving customer demands, and identify new opportunities.

Key features of BI include predictive analysis, trend identification, pattern recognition, and insight generation, all of which support tactical and strategic planning.

Importantly, BI emphasizes the integration of quantitative data with qualitative knowledge, including managerial judgment and organizational expertise, ensuring decisions are grounded in both statistical evidence and practical experience.

In today's competitive and rapidly changing environment shaped by globalization and technological innovation, BI has become essential for achieving sustainable growth.

It allows firms to track sales, optimize product offerings, enhance customer experience, and monitor preferences in e-commerce contexts (Khan & Quadri, 2012).

BI is often described as the process of converting data into information and ultimately into knowledge. Common data sources include industry conditions, competitiveness, consumer needs, decision-making processes, and broader economic, technical, and cultural trends.

Emerging in the industrial sector in the early 1990s, BI addressed managers' need for efficient corporate data analysis to improve decision-making and organizational awareness.

By leveraging BI, companies gain competitive advantage through accurate forecasting of trends and financial conditions. Proper collection and proactive use of BI enable firms to make advantageous decisions and strengthen their market position.

The primary objective of Business Intelligence (BI) is to support organizations in making better decisions.

BI reveals a company's performance relative to competitors, shifts in consumer behavior, purchasing patterns, market dynamics, upcoming trends, demographic and economic statistics, organizational capabilities, and the broader social, regulatory, and political context.

In today's fast-paced and competitive environment, the ability to react quickly and consistently to change is a crucial advantage, and BI enables firms to achieve this (Kunnathuvalappil Hariharan, 2018).

Core BI tasks include collecting, preparing, and analyzing high-quality data. Information from multiple sources is gathered, transformed, cleaned, loaded, and stored in data warehouses, from which relevant data is extracted for specific business areas.

BI architecture ensures that data flows seamlessly from origin to action, maximizing informational value at every stage.

This process forms part of a continuous improvement loop: gathering information, making decisions, evaluating outcomes, and applying lessons learned to future actions.

BI can be applied across all business functions—financial data, consumer behavior, or operational processes—by converting unstructured data into actionable insights. Decisions generate new data, which is reintegrated into the system, strengthening subsequent analyses. Organizations benefit significantly from BI, as it reduces guesswork, enhances communication and coordination across departments, and enables rapid responses to changes in financial conditions, customer preferences, and supply chain operations.

Ultimately, BI improves overall performance by treating information as a critical organizational asset, second only to people.

Acting swiftly and accurately on reliable data often provides a competitive edge, while timely responses to customer needs increase satisfaction.

Academic interest in BI grew in the mid-1990s, and within a decade, research transformed it from a set of simple techniques into a robust methodology for extracting and analyzing data (Kunnathuvalappil Hariharan, 2018).

## 2.2 Components of BI systems

Online Analytical Processing (OLAP) enables business users to manipulate data across dimensions such as time or hierarchies, providing multidimensional views for reporting, analysis, modeling, and planning.

OLAP tools work with data marts or warehouses to identify patterns and evaluate key variables, while reporting software aggregates data to keep management informed.

Other BI tools include data mining, forecasting, decision support systems, document management, dashboards, geographic information systems, and trend analysis.

Advanced analytics—such as predictive analytics and forecasting—apply statistical methods to generate predictions and confidence levels.

Enterprise Resource Planning (ERP) systems, initially designed for inventory control and production planning, have evolved into integrated platforms connecting sales, inventory, procurement, and finance.

This integration improves information flow, decision-making speed, and responsiveness to market changes (Caserio & Trucco, 2018).

With ERP II, these systems expanded to include modules interfacing with supply chain management (SCM), BI, and customer relationship management (CRM).

Integrating BI tools with ERP systems allows businesses to transform operational and financial data into actionable insights, enabling real-time monitoring of sales, inventory, marketing performance, and other activities.

For e-commerce companies, this connectivity is particularly valuable. BI combined with ERP data helps firms understand customer behavior, analyze purchasing trends, identify market opportunities, and optimize logistics and delivery.

By relying on BI insights rather than intuition, e-commerce businesses can achieve sustainable growth through improved competitiveness, performance, and customer satisfaction.

ERP II's efficacy hinges on how well the enterprise system incorporates the available technology. To guarantee that data from every department is available and usable, the

tools must be completely integrated with the business's operations; their existence alone is insufficient. This makes it possible for businesses to make thorough, prompt, and well-informed decisions that promote productivity, expansion, and long-term viability.

Real-time BI: It makes it possible to provide analytics in real-time via interactive displays, messaging apps, and/or email. (Caserio, C., & Trucco, S, 2018)

**Data marts and warehouses:** The effectiveness of ERP II depends on how well enterprise systems integrate available technologies.

Full integration ensures that data from all departments is accessible and usable, enabling comprehensive, timely, and well-informed decisions that foster productivity, growth, and long-term viability. Real-time BI enhances this by delivering analytics instantly through interactive dashboards, messaging platforms, or email (Caserio & Trucco, 2018).

Data warehouses are central to BI, serving as integrative, subject-oriented repositories that manage corporate records for integration, cleaning, aggregation, and querying.

They may include operational data for enterprise-wide tactical decisions, often updated in real time rather than stored as static snapshots. Sources include operational databases, historical records, external data (e.g., Internet or market research), and existing warehouse environments.

Data warehouse systems typically feature back-end tools for extracting data from multiple sources and front-end tools for retrieving and displaying information. SQL Server is one example of a BI toolkit used in this context (Vaisman & Zimányi, 2014).

Data marts, in contrast, are department-specific repositories tailored to predefined needs. Each department—such as marketing, sales, or finance—owns its own data mart, with unique configurations and applications. While similar to warehouses, data marts are distinct in their customization, supporting specific business functions or units.

They store operational data to help professionals analyze past trends and prepare for future decisions. A single organization may operate multiple data marts, each designed to meet specialized requirements (Vaisman & Zimányi, 2014).

## **BI for Performance Improvement and Strategic Decision-Making in E-Business**

Business Intelligence (BI) supports daily business decisions by collecting, analyzing, and presenting large volumes of data in concise, high-quality reports (Abualoush & Abusweilem, 2019).

It improves corporate performance by providing actionable insights and strengthening decision-making processes (Alyan, 2022).

BI reduces uncertainty by integrating technologies and applications to gather, access, and evaluate company data (Alzghoul et al., 2022).

Arefin et al. (2022) highlight BI's ability to collect data from diverse sources and apply advanced analytics to meet user needs. The Gartner Group defined BI as a set of technologies and methodologies—including J2EE, DOTNET, Web Services, XML, data warehousing, OLAP, and data mining—designed to enhance enterprise efficiency and support competitive decision-making (Arefin et al., 2022).

Bach et al. (2018) classified BI technologies by information delivery methods: reporting, statistical analysis, ad-hoc analysis, and predictive analysis.

BI is now considered an integrated solution driving technological innovation, with its impact depending on how effectively business challenges are identified and addressed. Božič & Dimovski (2019) emphasized BI's efficient data warehouses and reactive components that support time-sensitive processes, enabling tactical and operational decision-makers to align actions with company strategy.

Chen & Lin (2021) expanded BI's definition to include tools for data mining, ERP, knowledge management, and decision support systems. Gauzelin & Bentz (2017) added BI software for database queries, ETL, OLAP, data mining, and visualization.

BI tools include OLAP for multidimensional analysis, reporting software for aggregated views, and technologies such as data mining, forecasting, dashboards, GIS, MIS, SaaS, and predictive analytics (Maaitah, 2023).

Under Corporate Performance Management, portals, scorecards, and dashboards integrate BI components into comprehensive narratives—for example, balanced scorecards combining financial and learning measures.

Real-time BI further enhances decision-making by delivering metrics instantly through interactive displays, messaging apps, and emails.

**Data Marts and Data Warehouses:** Data warehouses are a significant, integrated, and subject-oriented component of BI.

They manage enterprise records through integration, cleaning, aggregation, and querying, facilitating the dissemination of live operational data for broad tactical decision-making rather than static snapshots (Maaitah, 2023).

**Data Sources** include existing warehouses, market research firms, historical records, operational databases, and web data.

These sources may be relational databases or other structures supporting business applications, containing both structured (spreadsheets, tables) and unstructured (text files, images, multimedia) data (Maaitah, 2023).

**Data Marts** are collections of topic areas tailored to specific departments, each with its own data, software, and hardware.

While similar to warehouses, data marts are customized to meet predefined requirements and support particular functions, processes, or units.

They store operational data useful for analyzing historical trends and preparing strategies. Organizations may operate multiple data marts, each designed for unique departmental needs (Maaitah, 2023).

**BI Middleware** tools act as a bridge between transactional systems and decision-support applications, separating processes that enhance transaction efficiency from those that improve decision-making.

BI applications include data mining, statistical analysis, forecasting, OLAP, and decision support (Maaitah, 2023).

Data collection is the cornerstone of any intelligence system of any business, companies depend and relies on advanced tools and technologies to collect data from multiple sources, such as financial transactions, users' behavior online and the results of marketing campaigns.

This process aims to provide comprehensive and trusted data that could be used in analysis and decision-making processes. In the context of e-commerce, data sources typically include:

- **Customer Data:** such as purchases, visits, and product preferences.
- **Operational Data:** such as supply chain and inventory management.
- **Market Data:** such as market trends and competitor prices.

(Lutfi et al., 2022) study shows that effective data collection can enhance the ability of companies to effectively predict market needs, and faster response to the changes in the market.

## 2. Data Quality

After data collection, data quality comes to ensure that used data in analysis is real and trusted.

Data quality dimensions include:

- **Accuracy:** the extent to which data is true and free of errors.
- **Completeness:** the extent to which the data covers all needed areas.
- **Consistency:** consistency of collected data with different standards across different systems.
- **Timeliness:** update data to ensure that it reflects the current situation.

In the Jordanian context, (Ahmad Arikat, 2024) showed that poor data quality leads to making inaccurate decisions, which negatively affects institutional performance in e-commerce.

## 3. Data Integration

is considered a critical component in business intelligence and digital transformation as it facilitates the seamless combination of data from multiple sources, enhancing decision-making and optimizing business processes (Al-Negrish & Almomani, 2024; Qatawneh, Alkhasawneh, & Althonayan, 2023; Rawash, 2021).

Processes of data integration include:

- **Data Consolidation:** Merging data from various sources into a single coherent dataset.

- **Data Transformation:** Converting data into a suitable format for analysis and interpretation.
- **Data Harmonization:** Standardizing data structures across different systems for consistency.
- **Data Synchronization:** Ensuring real-time updates across integrated platforms.

Research by Al-Negrish & Almomani (2024) emphasized that successful data integration allows Jordanian SMEs to improve market responsiveness and operational efficiency by leveraging accurate, real-time data (Al-Negrish & Almomani, 2024). Similarly, Qatawneh, Alkhasawneh, & Althonayan (2023) highlighted its role in enhancing competitiveness in e-commerce by optimizing data flow and analytics (Qatawneh, Alkhasawneh, & Althonayan, 2023).

#### 4. Data Mining

is considered a crucial stage in business intelligence as it allows businesses to explore large datasets to identify hidden patterns, correlations, and insights that can drive strategic decision-making and enhance competitive advantage. The main processes of data mining include:

- **Association:** Discovering relationships between variables within large datasets.
- **Classification:** Grouping data based on shared characteristics.
- **Clustering:** Segmenting data into distinct groups for analysis.
- **Prediction:** Using historical data to forecast future trends and behaviors.

Research by Al-Negrish & Almomani (2024) and Qatawneh, Alkhasawneh, & Althonayan (2023) demonstrated that the application of data mining techniques in Jordanian e-commerce companies enhanced their ability to predict customer behavior, optimize inventory, and improve decision-making processes (Al-Negrish & Almomani, 2024; Qatawneh, Alkhasawneh, & Althonayan, 2023)

The sustainable growth concept in the e-commerce sector refers to the company's ability to expand and continue in the digital market while maintaining operational efficiency, customer satisfaction and having a long-term revenue stability. That can be achieved by benefiting from BI tools that allow companies to analyze data and make decisions based on accurate, reliable and realistic data (Lutfi et al., 2022; Ahmad Arikat, 2024).

The impact of business intelligence on sustainable growth is indicated by the following performance indicators:

- **Sales Growth Rate:** The sales growth rate is considered as one of the main indicators that reflect the results of companies through their usage and reliance on BI tools. Where business intelligence can optimize marketing campaigns and identify best-selling products, which contribute to the increase of sale rates over periods of time (Verma & Sharma, 2021).
- **Market Expansion:** Data analytics enable companies to understand opportunities in the market, which helps them to expand geographically or target a new segment of customers. BI contributes to this expansion by offering insights into customers' behavior and the trends of the market, locally and even internationally (Ferreira, Pedrosa, & Bernardino, 2019).
- **Repeat Purchases:** Customers coming back or being frequent is an indicator of customer satisfaction and brand loyalty, businesses can understand customer preferences and suggest products in real time, which enhances the likelihood of returning to the business again (Lutfi et al., 2022).
- **Customer Confidence:** When customers feel that the company is interacting with them and satisfy their needs based on accurate analytics, that enhances their confidence in the brand. BI tools help build trust by offering experiences that are personalized and having a more efficient customer service (Ahmad Arikat, 2024).

We can say that business intelligence tools represent a real lever for achieving sustainable growth in the e-commerce sector, by improving sales processes, enhancing customer loyalty, expanding operations and achieving higher operational efficiency in performance. Each performance indicator mentioned reflect a vital aspect of this growth and directly impact and contributes to achieving the company's long-term vision in the Jordanian market.

Data warehousing experts see BI as an additional system that is still in its infancy. They see it as a technological platform that facilitates decision-making, and it seems that data mining professionals see it as a collection of sophisticated decision support tools combined with applications for data mining techniques and algorithms. From the perspective of statisticians, BI is a multifaceted instrument based on forecasting analysis. The consolidation of data from multiple enterprise operational systems into an enterprise

data warehouse has been repeatedly stated as the key to the success of BI systems. However, in the case of universities, a full-fledged enterprise data warehouse is still uncommon due to the amount of work needed to consolidate all enterprise data.

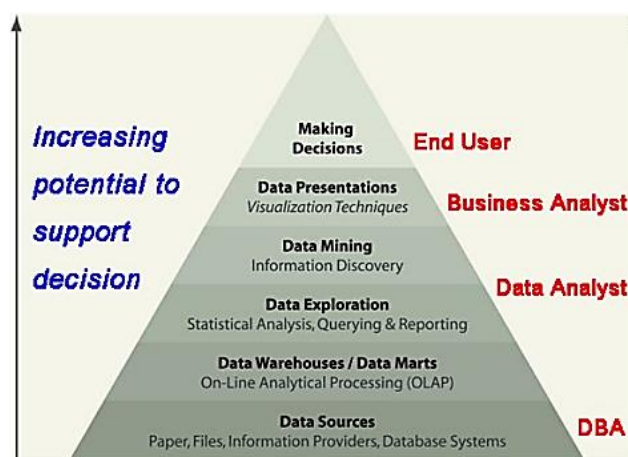
Daradkeh et al. (2022) assert that only competitive businesses will be able to maintain their market position in the recently developed, very dynamic business environment. Universities can only make an impression if they use data about their customers, market, and operations to seize commercial possibilities. According to a number of widely used surveys, including those conducted by Gartner, Forrester, and the International Data Centre, most businesses worldwide are inclined to invest in business intelligence (BI). In the last ten years, the largest investments have been made in customer relationship management (CRM) and enterprise resource planning (ERP), as a result of the information that these systems gather giving them a competitive edge. Companies must enable information analysis and application in order to make timely choices for their operations and processes, since the primary goal of every corporate organisation is to strive for the correct access to information at the right time. The marking of seasonal merchandise or the provision of customer-specific recommendations are two examples of this. In these situations, businesses must obtain information as quickly as possible, and the use of smarter business processes, such as business intelligence tools, may have an impact on the company's profitability and return value. (Daradkeh et al. ,2022)

### **2.3 BI applications in e-business**

Over the last twenty years, e-business has been developing quickly. Examples of emerging e-services on the Internet include knowledge-driven customer relationship management, intelligent B2C recommenders, and smart online e-services. Massive volumes of data stored in databases and intricate networked computer systems underline these e-services. Situational services, which are made up of two or more different e-Services that have been blended to create a new integrated experience, are necessary due to the increase in demand. Because of the e-Service construction alterations, e-Service integration ultimately turns into a mash-up system.

The idea of using a collection of technologies to transform data into useful information is known as business intelligence (BI), BI techniques include data visualization, statistical analysis, data mining, and information retrieval. It is possible to

combine and transform vast volumes of data from many sources and formats into essential business information. A broad overview of the process of turning data into business information is shown in Figure 2. Both technical and commercial expertise are involved in the process. It helps end users make decisions by transforming vast amounts of data into insightful results.



**Figure 2-1 Business Intelligence Processing**

**ROOTS FOR DATA-MINING** It is evident from examining the many authors' descriptions of data mining that there is a lack of consensus over what exactly data mining is and how to define it. Is data mining a novel idea or just a type of statistic enhanced by learning theory? We believe that the majority of data-mining issues and their solutions have their origins in traditional data analysis. The two most significant fields from which data mining originated are machine learning and statistics. Since mathematics is the foundation of statistics, there has been a focus on mathematical rigor and the goal of proving something is logical before putting it to the test in real-world situations. On the other hand, computer practice is where the machine-learning community got its start. As a result, people are now more pragmatic and are willing to try things out to see how well they work before waiting for official evidence of their efficacy. One of the main differences between statistical and machine-learning approaches to data mining is the relative importance they place on models and algorithms, if the importance of mathematics and formalizations is one of the main differences. The concept of a model is nearly the only thing that drives modern statistics. The data may have resulted from a hypothetical structure, or an approximation of a structure. Machine learning tends to concentrate more emphasis on algorithms than on models, as is the case with statistics. It

should come as no surprise that the word "learning" itself implies a procedure, an implicit algorithm. Control theory, which is mainly used in industrial processes and engineering systems, is also the foundation of basic modeling concepts in data mining. System identification is the general name for the challenge of identifying a mathematical model for an unknown system (also known as the target system) by looking at its input-output data pairs. System identification serves a variety of functions, but from the perspective of data mining, the two most crucial ones are behavior prediction and the explanation of the interactions and connections among a system's characteristics. Two top-down processes are often included in system identification: 1. Structure identification: In order to identify a class of models within which the best model should be found; we must apply our prior knowledge about the target system. The parameterized function  $y = f(u,t)$ , where  $y$  is the model's output,  $u$  is an input vector, and  $l$  is a parameter vector, is typically used to represent this class of models. The function is based on the target system's natural laws, the designer's expertise, and intuition, and its determination depends on the problem. 2. Parameter identification: In the second phase, since the model's structure is established, we just need to use optimization techniques to find the parameter vector such that the final model,  $y = f(u,t^*)$ , can accurately describe the system. (Kantardzic, M., 2011)

Conversely, DM is a basic process for transforming data into meaningful patterns. From DM models, rules can be heuristically extracted as output outcomes. Historically, data mining techniques have been divided into two categories: verification-driven and discovery-driven. The former creates a false link or pattern and then examines the data to find evidence, whereas the latter depends on intricate data manipulation to find links, patterns, rules, or functions. The three components of DM are data acquisition, data mining, and information representation. But up until now, most of the research has focused on either the technical layer's implementation of algorithms or the business layer's representation of knowledge. The two DM approaches have, nevertheless, frequently been applied separately. Business intelligence-driven data mining, or BIdDM, is a new form of data mining that blends knowledge-driven and method-driven data mining. It aims to offer a way to close the gap between current data mining methods and e-commerce business intelligence know-how. Based on business requirements, BIdDM seeks a flexible approach to data mining deployment. Its two functions are data mining and building a four-layer architecture. The four layers are the knowledge layer, e-Service

layer, method layer, and data layer. The components of each layer can be reused. The components can be added or removed as needed.

Generally speaking, DM techniques and the necessary data may be used to create BI directly. Two popular approaches for putting data mining into practice are SEMMA and CRISP-DM. While CRISP-DM suggests a project implementation for the data mining process, SEMMA concentrates on finding and extracting possible significance from data collection. Traditional approaches like those, however, need a significant level of human involvement.

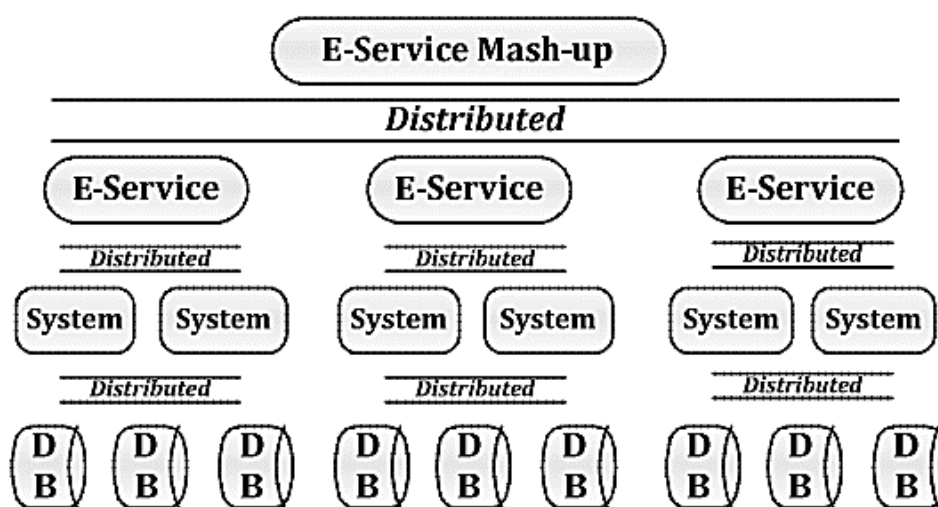


Figure 2-2 e-Service distributed architecture

### A. Data Mining in Distributed Settings

Resource sharing has grown quickly, leading to the development of distributed systems that can make use of the computations. There are many practical uses for data mining (DM), which offers strong methods for extracting valuable information from vast amounts of data. On the other hand, conventional DM algorithms presume that the data is static, memory-resident, and centrally gathered. Managing and processing massive amounts of data with limited resources is difficult. For instance, vast volumes of data are generated rapidly and kept in several places. Centralizing them in one location gets more and more costly. Furthermore, classic DM algorithms typically face a number of issues and difficulties, including poor processor power, memory limitations, insufficient hard drive space, and more. Distributed data mining (DDM), also known as DM on distributed computing environments, has been showing promise as a useful substitute in numerous applications to address the aforementioned issues. Distributed frequent item-set mining, distributed frequent sequence

mining, distributed frequent graph mining, distributed clustering, and privacy preserving of distributed data mining are among the cutting-edge DDM techniques that are surveyed. Finally, a summary of the prospects of data mining jobs in dispersed environments is provided. (Gan, W., Lin, J. C. W., Chao, H. C., & Zhan, J., 2017)

## **B. Knowledge-Driven and Method-Driven Information Mining**

Method-focused Nowadays, DM is a widely used data mining method. It focuses on developing and putting into practice data mining and modeling methods. Up until now, a great deal of research has been done on the foundations of mining algorithms for both distributed and centralized data mining. For example, k-means clustering algorithms can be used to recover hyper-spherical clusters. Boosted regression trees are used to fit micro regression trees to instances in order to model data. As a result, many publications in the research community address performance issues and the benefits of specific algorithms. information-based DM proposes that data mining should concentrate on the types of information that are deemed valuable rather than methods and procedures. It suggests that DM has to use information more skillfully in order to achieve better outcomes than it now does. It first identifies the issues under investigation and the data that is sought, then it connects the results of patterns, trends, etc. Method-driven DM is implemented via a bottom-up design approach. After analyzing the data, it uses mining algorithms to find patterns and makes an effort to interpret them. Knowledge-based Subject-matter experts' knowledge serves as the foundation for DM's modeling and mining. One well-liked method is the ripple-down rules (RDR), which finally show a high degree of agreement with the classifications of other experts. The distinction between knowledge-driven and method-driven data mining is one of the most difficult problems in BI applications. Information is one of the government's most vital resources. When properly applied, it could help planners and decision-makers come to educated judgments that will help the intended population. However, in order to make the most of information, planners and decision makers want instant access to relevant data in a suitably condensed manner. Despite taking several steps to computerize their operations, government decision makers are now experiencing difficulties in obtaining pertinent information in a timely manner since they must request and rely on IT professionals to supply specific reports, which frequently take a long time to compile. An information warehouse can provide decision-makers with strategic insight and a thorough grasp of the situation. Without depending

on their IT team, decision makers can now make snap decisions at a micro level much more easily. By organizing data into a usable data warehouse, decision makers can have a flexible tool that allows them to make educated policy choices for citizen facilitation and access their influence throughout the targeted sector of the public.

The need to improve decision-making abilities with ever-increasing computing power and the availability of RDBM Systems across diverse platforms have led to an increase in the amount of information used in the decision-making process. Even though the amount of data in each sector has grown to hundreds of thousands of gigabytes (GBs) or megabytes (MB), the peculiarities of database structure make it impossible to perform a comprehensive analysis of the data as one would like. Additionally, even if one is analyzing a large amount of data, one should be aware of the entire design of the data model and its contents. The contents and data models are nearly impossible for anyone to fully understand, and ad hoc query analysis is simply not practical. This implies that only a data modeling specialist can carry out the necessary analysis. This makes the flaws in the conventional systems more evident. Since senior officials and decision makers want to conduct thorough research before making a decision, the agencies are currently looking for a framework that can accomplish a number of goals. Many ebusiness models are currently used to create e-business applications. Examples of these models include shopfront, auction, portal, dynamic pricing, business-to-business, online trade and finance, and e-learning models. The shopfront approach with shopping cart technology, which stores all customer and product data in a merchant database, is the most often used variation. E-business intelligence is also obtained by data miners. Senousy and companions). Shu, X., & Ye, Y., 2023)

The need for innovative analytical techniques beyond the conventional statistical procedures to extract new knowledge from the data mine gave rise to the interdisciplinary fields of knowledge discovery and data mining. This emergent method is a dialectic, inductive, and deductive research procedure. In order to address causal heterogeneity and enhance prediction, the data mining approach automatically or semi-automatically takes into account a greater number of joint, interacting, and independent predictors. It enhances model goodness of fitness, uncovers meaningful and valid hidden patterns in data, detects nonlinear and non-additive effects, offers insights into data developments, methods, and theory, and advances scientific discovery—all without undermining the

traditional model-building approach. When the explicit model structure is unclear and it is challenging to create algorithms with acceptable performance, machine learning creates models and algorithms by learning and improving from data. The latest advancement involves combining this new predictive modeling paradigm with the traditional parameter estimate regression approach to create better models that integrate prediction and explanation. Shu, X., & Ye, Y., 2023)

The storefront e-business paradigm, in which the merchant's databases act as the data servers, may make use of the OIKI DDM concept. The data kept in the dispersed databases used in the e-business may thus be examined by the merchant. Figure 4 illustrates how the OIKI DDM model in the data analysis may help the storefront e-business model. In response to the DM request, the e-business analyzer software forwards MADMs and MAKIs to the necessary databases. Each database's data mining duties are carried out by the MADMs. The smaller outcomes move to the bigger ones as a consequence of the knowledge integration activities carried out by the MAKIS. To maximize the process of gradual knowledge integration, the business analyzer software manages the movement of results across merchant databases.

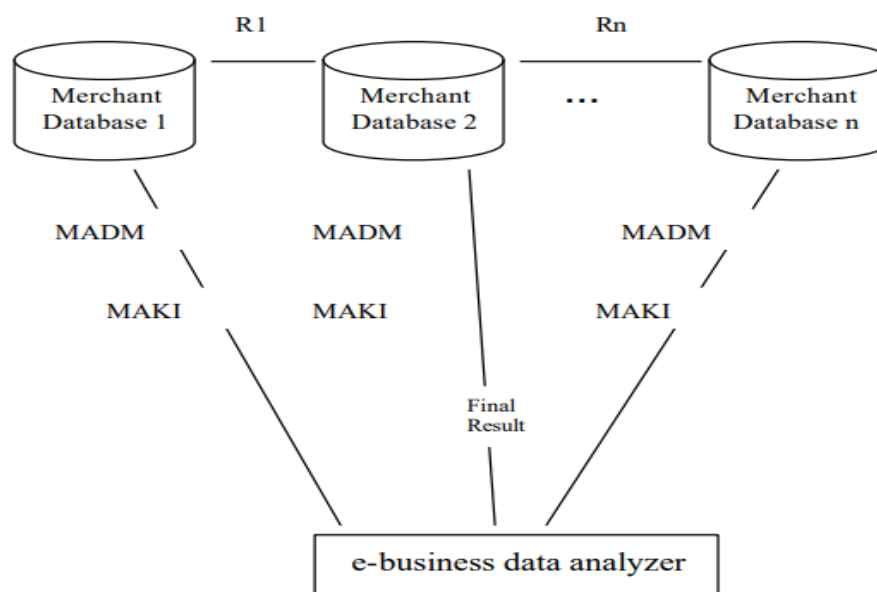


Figure 2-3 Applying OIKI DDM to storefront e-business model

Globally, rapidly evolving technologies have an impact on our daily life. Utilizing the existing technologies, businesses are gradually implementing them one by one to grow their operations in the marketplace. The productivity and expenses of businesses are significantly impacted by e-business. Because of its straightforward applications, it also stands a possibility of becoming extensively used. As a result, it has a significant economic impact, particularly on SMEs. Information and communication technology (ICT) has changed the way trade and commerce are conducted as a result of the adoption of e-Business. The current study examines the advantages of e-business as well as the drawbacks that a company may encounter. Examining and identifying the models and strategies employed by SMEs in e-business is the study's main goal.

Scholars and practitioners have developed a number of maturity models, usually referred to as "stage models," to gauge the degree of e-business adoption in SMEs. These models may be used as tools to show the evolution and adoption route of e-business. The Department of Trade and Industry (DTI) adoption ladder in the United Kingdom (see Fig. 5) is one of the first of these models and is used to measure how well SMEs are implementing e-business, according to the approach, SMEs embrace e-business in phases that are planned and sequential. Prior to 2) establishing a website, 3) using e-commerce to handle orders and payments, 4) integrating with the supply chain, and 5) expanding systems to include access for customers, suppliers, and partners, the adoption process begins with 1) using email for internal and external communication. (Isa, H., Abdul Rahim, M. E., Mohammad Ariffin, N. A., Embran, R. A., Han, S. H. M. R., Subramanian, U., & Abdullah, N., 2023)



Figure 2-4 DTI's Adoption Ladder.

### Digital Intelligence and Digital Transformation in Jordanian Institutions

The rapid development of digital technologies has reshaped how organizations operate, compete, and deliver value. Digital intelligence—defined as the systematic collection, analysis, and interpretation of large-scale data using advanced tools such as artificial intelligence, big data, and analytics—has become a key enabler of this transformation, driving innovation, efficiency, and long-term success.

In Jordan, globalization, evolving consumer expectations, and the shift toward knowledge-based economies have heightened the importance of digital intelligence and transformation.

National initiatives, such as the Jordan Digital Transformation Strategy, emphasize integrating ICT into public and private sectors to modernize operations, enhance responsiveness, transparency, and competitiveness.

Institutions in sectors like banking, e-commerce, education, and government services increasingly recognize the role of digital intelligence in analyzing consumer behavior, forecasting market trends, and designing user-centered services.

However, successful digital transformation requires more than adopting new technologies—it demands cultural change, talent development, and supportive regulatory frameworks that foster innovation and trust.

This section focuses on how Jordanian institutions embrace digital intelligence as a foundation for transformation, highlighting both challenges (resource limitations,

infrastructure gaps, resistance to change) and benefits (greater competitiveness, improved service delivery, and contribution to national development goals).

### **Digital transformation and its role in improving corporate performance**

Digital transformation is commonly defined as the integration of digital technologies to fundamentally reshape consumer experiences and corporate processes.

Key enablers include cloud computing, artificial intelligence, data analytics, and the Internet of Things (IoT), which collectively drive changes in organizational strategies and procedures (Kraus et al., 2021).

For businesses, digital transformation is a strategic necessity, requiring rethinking of strategies, customer engagement, and operational efficiency to secure competitive advantage.

Challenges to implementation include cybersecurity risks, legacy systems, and resistance to change, all of which must be addressed for successful transformation (Bughin et al., 2019).

Leadership and organizational culture play a critical role, with effective transformation depending on leaders who champion digital initiatives and foster innovation.

Digital transformation also reshapes existing business models, prompting firms to explore new ways of creating and delivering value in the digital economy (Verhoef et al., 2021).

A consumer-centric approach is essential, particularly for SMEs. Incorporating user feedback into digital solutions ensures adaptability to customer needs, enhances competitiveness, and builds loyalty. For marginalized communities, this strategy improves service delivery, fosters inclusivity, and enables active participation in digital services.

By integrating consumer insights, SMEs can innovate and develop services that improve satisfaction while contributing to a more equitable digital marketplace.

Efficient systems for collecting and analyzing customer feedback are central to digital transformation.

SMEs can leverage platforms such as social media, mobile applications, and surveys to gather real-time insights into customer pain points, preferences, and areas for improvement.

This is particularly important for underserved populations, whose needs often differ from those of affluent clients. Prompt feedback collection ensures that digital tools remain current and user-friendly.

Data analytics is essential in this process, enabling SMEs to identify trends and patterns in feedback.

Advanced techniques such as sentiment analysis and predictive modeling allow firms to anticipate customer needs, prioritize accessibility, and proactively address issues. Beyond analytics, co-creation processes—such as workshops and focus groups—empower customers to contribute ideas, fostering loyalty, responsibility, and long-term satisfaction (Ewim, Okeke, Alabi, Igwe, & Ofodile, 2024).

Successful digital transformation also relies on collaboration within digital ecosystems. Engaging external partners and leveraging shared resources are considered vital for sustainable change.

Ethical concerns—including algorithmic bias, data governance, and privacy—are increasingly acknowledged as critical factors. Responsible and sustainable digital practices must integrate ethics to ensure trust and long-term viability (Verhoef et al., 2021).

## **2.4 Digital Transformation's Effect on Improving Business Performance**

The literature extensively examines the impact of digital transformation on business performance, highlighting its multifaceted effects on strategic positioning, efficiency, and innovation.

Integrating technologies such as cloud computing, data analytics, and artificial intelligence enhances operational efficiency and streamlines organizational processes. Embracing digital transformation as a strategic imperative enables firms to align strategies with dynamic market conditions and gain competitive advantage.

It also fosters innovative and adaptable organizational cultures that respond proactively to change (Halim, Kesuma, & Siregar, 2023).

Digital transformation often involves shifting toward customer-centric strategies, improving satisfaction and experiences, which in turn elevate overall performance.

Data analytics strengthens decision-making by providing informed insights, while agile operations allow businesses to adapt quickly to market shifts. Collaboration within digital ecosystems further enhances performance by leveraging collective strengths and synergies. Ethical considerations—such as data governance, privacy, and corporate reputation—are equally vital for sustaining trust and competitiveness.

A well-designed digital transformation strategy is essential, serving as a roadmap for planning, implementation, and review. Studies indicate that firms increasingly move from strategy conception to execution, updating business models and processes by embedding new values and advanced technologies.

Effective transformation requires digitizing not only technical systems but also workflows, teamwork, decision-making, and customer experience delivery. Ultimately, digital transformation is considered the optimal path for businesses seeking sustainable performance improvement (Halim, Kesuma, & Siregar, 2023).

In today's rapidly evolving business environment, information technologies (IT) are viewed as critical to corporate survival and growth.

The adoption, efficient use, and alignment of IS/IT systems are reshaping operations, customer service, marketing, distribution, and related practices. Managers and scholars increasingly regard IT as a cornerstone of corporate capabilities and a source of long-term competitive advantage.

Sustainability, understood as continuity across ecological, social, and economic dimensions, is closely tied to IT's role in enabling firms to compete effectively (Erkmen, Günsel, & Altındağ, 2020).

Research emphasizes the importance of IT capabilities and knowledge-based systems in achieving perceived organizational performance (POP) and sustainable competitive advantage (SCA). Firms that effectively utilize IT gain flexibility and adaptability, while those that fail to integrate IT into operations face challenges in sustaining competitiveness.

The resource-based view (RBV) and Porter's competitive strategy framework are often used to analyze IT's impact, highlighting IT assets as valuable resources that shape firm strategy and industry profitability. Sustainable IT capabilities enhance distinctiveness or reduce costs, thereby strengthening competitive positioning (Erkmen, Günsel, & Altındağ, 2020).

Organizational knowledge capacity—developed through human and IT resources—is another key determinant of SCA. Knowledge management processes, supported by IT, improve business procedures and decision-making by combining organizational, technological, and managerial capabilities.

Firms that leverage IT to understand customers, markets, competitors, and emerging technologies can build sustainable business models and maintain relevance in dynamic environments.

Empirical studies show mixed results: while some confirm a positive correlation between IT investments (e.g., big data analytics) and corporate performance, others argue that IT expenditures do not always translate into efficiency gains. Successful firms are distinguished by their effective and efficient use of IT, which enhances decision-making, workflow, teamwork, and overall performance.

The literature continues to explore the mechanisms linking IT to financial outcomes, reinforcing the view that IT is indispensable for survival, growth, and sustainable competitive advantage (Erkmen, Günsel, & Altındağ, 2020).

Digital transformation refers to organizational changes driven by technologies such as big data, analytics, cloud computing, mobile platforms, and social media.

These innovations are reshaping corporate landscapes, compelling firms to adopt competitive digital strategies and embrace enterprise-wide transformation (Markus & Loebbecke, 2013; Westerman et al., 2014).

Digital technologies disrupt traditional business models, creating opportunities but also challenges in initiating transformation. A Forbes Insights report (2016) revealed that 31% of CEOs and CIOs expected digital transformation to spread across their value chains, while 42% anticipated their roles would focus primarily on digital strategies within five years.

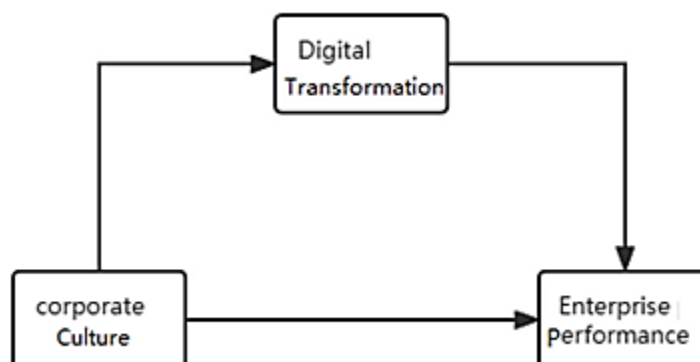
Despite the opportunities, firms face difficulties integrating digital technologies, including communication issues across value chains, system redesign, and the complexity of combining digital and traditional models.

Adoption often requires major organizational restructuring and new processes, yet little is known about the factors that ease this transition. Earlier studies highlight the need for theoretical frameworks to define the causes and impacts of digital transformation (Abrell et al., 2016).

Recent research seeks to address this gap by examining digital transformation as a mediator between IT competency and business performance, Freitas, Maçada, & Brinkhues (2024) propose a research model based on survey data from CIOs in U.S. firms, analyzing IT capability as a prerequisite for digital transformation and, consequently, digital business strategy, Their findings suggest that IT competencies directly influence transformation success, offering managers practical guidance for establishing a strong digital footprint in increasingly digital markets.

Ultimately, digital transformation is both a technological and strategic imperative, It requires firms to integrate analytics, big data, cloud, social media, and mobile platforms into operations, while simultaneously rethinking business models and processes to remain competitive and innovative (Freitas, Maçada, & Brinkhues, 2024).

Digital transformation refers to the changes based on digital technologies that bring about distinct changes in business operations, business processes, and value creation, while organizations are continuously changing and evolving in response to the shifting business landscape (Libert et al., 2016).



**Figure 2-5 The Theoretical Framework of the study**

The dependent variable in this model is business performance, the moderating variable is corporate culture, and the independent variable is digital transformation. We think that although corporate culture may modify the link between digital transformation and corporate performance, digital transformation will have a direct impact on corporate performance. The concepts and strategies used by businesses, organizations, or society in reaction to shifts in the digital age are referred to as the theory of digital transformation. In order to achieve efficiency improvements, creative breakthroughs, and long-term competitive advantages, it places a strong emphasis on using digital technology and data-driven methodologies to transform conventional business models, processes, and value creation techniques. In addition to offering advice and direction to guarantee that they can adjust to the quickly shifting market demands and technology advancements, the digital transformation theory offers a framework to assist organizations and companies in understanding the potential and difficulties of the digital age. Strategic planning, organizational culture, technological architecture, talent development, and other topics are all covered by this approach. (Liu, Q., Wan, H., & Yu, H. 2023).

The notion of digital transformation aims to assist organizations in achieving sustainable development, increasing efficiency and competitiveness via innovation and reform, and completely comprehending and seizing the possibilities presented by the digital age. The theory is merely a guiding framework, and the actual operation must be modified and enhanced in accordance with the particular situation in practice. This is because the particular digital transformation strategy and implementation method must be tailored according to the particular situation and objectives of the organization.

Enterprise performance is a thorough assessment of a company's accomplishment of objectives and outcomes. In order to monitor and assess the performance and outcomes of businesses in a variety of areas, it is often based on a set of indicators and indicator systems. There are many ways to evaluate enterprise performance, and some typical performance indicators are as follows: (Liu, Q., Wan, H., & Yu, H. 2023).

**Financial performance:** including financial metrics that show the enterprise's profitability, solvency, and return on investment, such as sales revenue, profit, return on equity, cash flow, etc.

**Customer performance:** comprises metrics that show the company's market position and customer relationship management skills, such as market share, customer satisfaction, and customer retention rate.

**Operational performance:** measures the enterprise's management level and operational efficiency using metrics like production efficiency, cost control, and on-time delivery rate.

R&D investment, product development speed, innovation income percentage, and other metrics that show an organization's capacity for innovation and competitive edge are all included in innovation performance.

**Employee performance:** comprises metrics that assess the effectiveness of the company's human resource management as well as employee performance, such as employee satisfaction, training investment, and employee turnover rate.

**Social responsibility performance:** including metrics that show the enterprise's sustainable growth and social obligation fulfilment, such as environmental impact, social contribution, and corporate ethics. (Liu, Q., Wan, H., & Yu, H. 2023).

## **2.5 The role of big data and its analysis in decision support**

Information systems have evolved from simple transaction recording to supporting multiple levels of business decision-making.

Traditionally, internal data sources such as ERP systems and relational databases informed decisions on pricing, inventory control, and customer value.

These data were later integrated into warehouses for mining and analysis. Enterprise application integration (EAI) platforms further connected firms with suppliers and customers, improving communication, accelerating B2B transactions, and reducing costs (Jeble, Kumari, & Patil, 2017).

With the rise of the internet, cloud computing, mobile devices, and IoT, the concept of big data emerged, referring to vast volumes of structured, semi-structured, and unstructured real-time data.

Advances in computer science now allow heterogeneous datasets to be processed using statistical methods, enabling organizations to derive value from diverse sources.

Big data supports real-time, fact-based decision-making, offering more precise forecasting and reducing reliance on intuition.

Scholars define big data in varied ways: Boyd & Crawford (2012) describe it as a cultural, technical, and philosophical phenomenon; Fan et al. (2014) as an “ocean of information”; Kitchin (2014) as vast organized and unstructured data; Waller & Fawcett (2013) as datasets too large for traditional processing; and Dubey et al. (2015) as both machine-generated and social data. Regardless of definition, the emphasis lies not on the volume of data but on how organizations use it.

Effective big data analysis enables better decisions, strategic moves, and improved business outcomes (Jeble, Kumari, & Patil, 2017).

Decision-making is increasingly enhanced by algorithms and analytical tools. Companies such as Amazon and Netflix use recommendation systems that correlate user searches with purchase histories to predict future buying behavior, generating up to one-third of new sales.

Telecom firms employ big data to identify customers likely to churn, enabling targeted retention strategies (Artun & Levin, 2015).

Big data discovery projects uncover hidden insights, offering managers fact-based decision support rather than relying solely on intuition, which historically limited accuracy due to data scarcity (Dyché, 2014; Duan & Xiong, 2015).

Applications of big data span multiple domains, including cyberattack analysis, multilingual text analysis, health analytics, and patient network analysis.

Multicriteria decision-making tools support healthcare by structuring complex assessments, while RFID technologies enhance data warehouse integration (Zhong et al., 2015).

The challenge lies not only in data collection but in extracting actionable insights from vast, heterogeneous datasets. Big data addresses this through structured and unstructured analysis techniques (Chen, Mao, & Liu, 2014).

Big data is characterized by **volume, velocity, and variety**:

- **Volume**: massive datasets from diverse sources.
- **Velocity**: rapid data generation and processing needs.
- **Variety**: structured, semi-structured, and unstructured data from social networks, sensors, log files, and multimedia.

The value of big data lies in uncovering hidden patterns and enabling new perspectives for decision-making. Relational databases remain relevant but require optimization as data grows.

Big data applications extend to education, social media, and smart cities. For example, Grillenberger & Fau (2014) used educational data to analyze student performance, identifying learning patterns and enabling personalized teaching aids. Such applications demonstrate how big data supports innovation, efficiency, and tailored solutions across industries.

The growing significance of big data has led to the development of new instruments and frameworks for analyzing consumer behavior, economic forecasting, and financial market intelligence.

Competitive advantage increasingly depends on how quickly firms absorb and apply data insights. Beyond tracking customer actions, organizations can better understand the social context of behavior, enabling deeper strategic decisions.

Simon's decision model divides decision-making into three stages, each of which can be supported by organizational and technological tools.

From the organizational perspective, knowledge management (KM) techniques—such as knowledge mapping, communities of practice, best practices, narratives, peer assistance, and brainstorming—help elicit expertise and structure problems.

Multi-Criteria Decision Aid (MCDA) and Problem Structuring Methods (PSM) provide actionable recommendations for complex issues (Poletto, de Carvalho, & Costa, 2015).

Technological tools include data repositories (warehouses and marts), BI systems, AI applications, and problem-solving methodologies from knowledge engineering, such as CommonKADS and MOKA.

These tools facilitate knowledge discovery, storage, access, and analysis, complementing organizational approaches. Integrating BI technologies with predictive decision-making frameworks enhances the design and growth of decision support systems (DSS).

This predictive approach emphasizes organizing decision challenges, generating alternatives, and providing domain-specific information to support each phase of the process (Poletto, de Carvalho, & Costa, 2015).

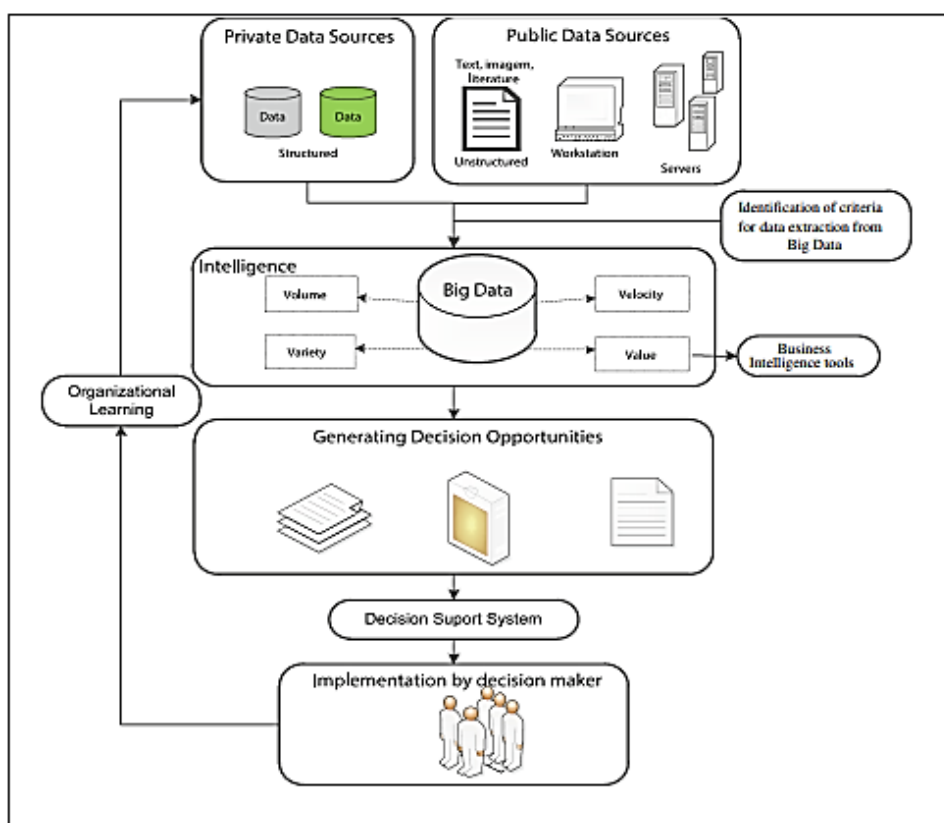


Figure 2-6 Integrated model of the decision-making process.

### Challenges and Obstacles in Adopting Digital Transformation and Business Intelligence in Jordan

Decision-making has become increasingly complex due to globalization, rapid economic growth, technological advancements, regulatory changes, and emerging markets (Niu et al., 2021).

These pressures necessitate advanced technological solutions to support timely and effective managerial decisions. Business Intelligence (BI) has gained prominence as a

critical enabler of data-driven decision-making, transforming large volumes of data into actionable insights that improve organizational performance (Velu, 2021).

BI systems mitigate information asymmetry and enhance competitive advantage by improving efficiency, product development, customer understanding, and customer relationship management (Al-Okaily & Al-Okaily, 2022; Hasan & Sudaryana, 2022).

Industries such as banking and insurance rely heavily on BI to monitor, coordinate, and optimize processes.

BI applications improve productivity, efficiency, and decision quality by converting diverse data sources into knowledge assets (Velu, 2021; Niu et al., 2021).

In insurance, BI supports compliance, risk assessment, and predictive decision-making, especially when combined with AI (Mohamad et al., 2022).

However, adoption challenges persist: managers struggle to identify relationships within complex datasets, limiting insight extraction.

Effective BI use requires not only technological tools but also organizational capability to leverage insights for innovation and operational improvement (Surya et al., 2021; Jaklič et al., 2018).

The BI literature remains fragmented, with ambiguous models and inconsistent findings regarding adoption determinants (Tavera Romero et al., 2021; Nithya & Kiruthika, 2021). This gap is particularly evident in developing countries such as Jordan, where empirical research on BI adoption and its organizational impact is scarce.

Parallel to BI, Big Data (BD) analytics has emerged as a transformative approach, offering descriptive, predictive, and prescriptive insights.

BD enhances decision-making and competitiveness but presents challenges due to the volume, velocity, and variety of data, complicating knowledge extraction and analysis (Jin et al., 2015; Shirdastian et al., 2019; Volk et al., 2020).

Big Data (BD) technologies are increasingly recognized as strategic assets that enhance managerial decision-making (Gonzales et al., 2015).

The global BD market has grown rapidly, reflecting its perceived importance across industries (Verhoef et al., 2016).

However, many organizations struggle with adoption due to unclear strategic objectives, low readiness, and limited integration across functions (Nam et al., 2019; Almaiah & Nasereddin, 2020).

Large enterprises leverage BD analytics for forecasting, customer behavior analysis, and operational optimization, while SMEs lag behind due to resource constraints, limited expertise, and lack of awareness (Nam et al., 2015).

The Technology–Organization–Environment (TOE) framework has been widely applied to study BD adoption in SMEs, highlighting variations in adoption based on firm size, infrastructure, and environmental conditions.

Results from large firms cannot be generalized to SMEs due to differences in resources and priorities (Lutfi et al., 2022).

National culture, regulatory environments, and market conditions further influence adoption, particularly in developing economies (Alharbi et al., 2016).

In Jordan, BD adoption remains underexplored, underscoring the need for empirical research (Lutfi et al., 2022).

In the financial sector, BI systems are critical for digital banking, supporting fraud detection, service quality, and strategic planning.

Modern BI platforms integrate AI-driven analytics for predictive insights and automated decision-making.

Yet, financial institutions in developing countries face challenges in IT infrastructure, analytics capabilities, cybersecurity, and regulatory compliance (Jaradat et al., 2024; Bany Mohammad et al., 2022; Al-Muhrami et al., 2021).

- **Infrastructure:** Advanced IT systems enable cloud-based analytics and real-time processing, while outdated hardware and poor connectivity hinder BI effectiveness (Spoorthi et al., 2024; Ali et al., 2024).
- **Cybersecurity:** Fraud, breaches, and unauthorized access pose risks. AI-powered mechanisms—encryption, multi-factor authentication, and intelligent threat

detection—enhance BI integrity and customer trust, Institutions lacking robust frameworks are less likely to adopt BI (Wang et al., 2024).

- **Regulatory Compliance:** Financial regulations, data protection laws, and anti-money laundering requirements ensure transparency but may constrain innovation and slow BI adoption (Balasubramanian et al., 2024; Farayola, 2024).

In Jordan, BI adoption faces challenges including weak analytical frameworks, limited data governance, and shortages of skilled personnel (Kannagi et al., 2023), Financial institutions must balance innovation with compliance and security to fully realize BI's potential.

### **The Role of Business Intelligence in Achieving Sustainable Growth and Innovation**

In the modern competitive environment, data has become one of the most critical strategic resources for achieving sustainable growth and innovation.

Sophisticated analytical tools transform raw data into actionable insights, enabling rapid and informed decision-making.

Business Intelligence (BI) systems play a central role in gathering, processing, and evaluating data to enhance competitiveness and operational performance.

BI supports strategic planning by providing accurate information about markets, customers, and internal operations.

It helps organizations identify emerging trends, discover opportunities for new products and services, and build innovative strategies.

Beyond innovation, BI contributes to sustainability by optimizing resource utilization, reducing waste, and monitoring social and environmental performance. This strengthens corporate reputation and aligns with sustainable development goals.

By improving the quality of strategic choices, boosting operational efficiency, and fostering innovation, BI enables organizations to adapt to shifting consumer demands and maintain long-term success.

Recent research and practical examples highlight BI's role in driving innovation and supporting sustainable growth through evidence-based strategies.

## **BI as a tool for promoting environmental sustainability and green innovation**

The rise of the knowledge economy and rapid technological advancements have positioned knowledge and intelligence as fundamental sources of organizational strength. Decision-makers rely on data and knowledge to address challenges, making the quality of decisions a key determinant of competitive advantage (Alomoush et al., 2021). Business Intelligence (BI) emerged as a response to this need, enabling trend analysis, process improvement, and effective strategic decision-making.

By integrating BI into **Strategic Entrepreneurship (SE)**, leaders can better allocate resources, identify opportunities, and foster innovation.

SE empowers small and medium-sized enterprises (SMEs) to compete with larger firms by enhancing their ability to innovate, manage opportunities, and form alliances (Luu, 2023).

BI thus supports strategic leadership in adapting to environmental changes and achieving creativity and competitiveness.

In the context of **sustainable development goals (SDGs)**, BI contributes to justice and equality by optimizing resource use and supporting environmentally responsible practices.

Green Knowledge Management (GKM) refers to the use of environmental knowledge to drive innovation and sustainable performance.

Studies show that adopting green technologies enhances efficiency and environmental innovation (Wang et al., 2022), while GKM helps organizations achieve both strategic and environmental objectives (Sahoo et al., 2023).

There is a strong positive relationship between GKM and **Green Innovation (GI)**, as GKM fosters organizational awareness of environmental opportunities and disseminates green knowledge across the enterprise (Abbas & Sağsan, 2019).

This aligns with the global call to action embodied in the SDGs, which aim to address interconnected issues such as poverty, inequality, climate change, environmental degradation, and justice (Yikun et al., 2023).

Ultimately, BI serves as a bridge between strategic leadership and sustainability, enabling organizations to make informed decisions that promote green innovation, resource efficiency, and long-term competitiveness.

Although Green Knowledge Management (GKM) and Sustainable Development Goals (SDGs) have received significant scholarly attention, their combined influence with Green Technology Innovation (GTI) in achieving sustainability remains underexplored. This study seeks to examine the relationship between Business Intelligence (BI) and Sustainable Entrepreneurship (SE), focusing on GTI as a mediating factor and GKM as a moderating factor. The aim is to deepen understanding of how these elements interact to promote sustainability and entrepreneurship in dynamic environments.

Previous research highlights BI and SE as drivers of organizational performance and innovation, while GTI has proven effective in addressing environmental challenges and supporting long-term sustainability.

GKM facilitates the creation, dissemination, and application of environmental knowledge, yet limited empirical studies have integrated BI, GTI, GKM, and SE into a unified framework to assess their collective impact on SDGs.

BI, broadly defined as encompassing analysis, data warehousing, and decision support, has evolved into a precise set of tools and applications for data storage, reporting, forecasting, and extraction (Alzghoul et al., 2024).

Scholars offer varied definitions: Caseiro & Coelho (2019) describe BI as a set of tools and procedures for decision-making and competitive analysis, while Ukhalkar et al. (2021) emphasize BI's integration with business applications to transform data into actionable insights.

Al-Abbadi et al. (2025) view BI as a broad term combining databases, analytical tools, and methodologies to convert data into decisions.

Researchers continue to debate BI's dimensions. Some emphasize data gathering, evaluation, and storage, while others highlight competitive intelligence, performance management, and real-time processing. Studies by Cheng (2023) and Jafari et al. (2023)

identify **data warehousing, data mining, and OLAP** as the most significant and commonly cited dimensions.

By integrating BI with GTI and GKM, organizations can enhance SE, achieve sustainability objectives, and align with global SDGs. This combined framework underscores BI's role not only in operational efficiency and innovation but also in fostering environmentally responsible entrepreneurship.

Entrepreneurship is a key tactic for strengthening organizational competitiveness, with **Strategic Leadership (SE)** enabling firms to innovate, manage opportunities, and form alliances with larger companies (Alshawabkeh et al., 2024; Vedula, 2022).

SE helps organizations move from stagnation to leadership, adapt to environmental changes, and achieve long-term survival and growth (Tokhirovna & Khasanovich, 2024). It is now regarded as a survival strategy that fosters innovation, creativity, and optimal performance (Cristo-Andrade, 2024).

**Business Intelligence (BI)** underpins SE by converting unstructured data into actionable insights, managing large datasets, and identifying new opportunities for competitive strategies (Ayyaswamy, 2024).

**Green Technology Innovation (GTI)** supports several **Sustainable Development Goals (SDGs)**, including environmental preservation, sustainable economic growth, and social well-being.

**Green Knowledge Management (GKM)** complements this by producing, sharing, and applying environmental knowledge to encourage sustainable behaviors and reduce ecological impacts (David & Eva, 2017; Hummels & Argyrou, 2021; Ma et al., 2018).

To explain how BI influences SE, scholars reference multiple entrepreneurial theories:

- Weber's Theory of Entrepreneurial Growth
- Hagen's Status Withdrawal Theory
- McClelland's Achievement Theory
- Schumpeter's Innovation Theory
- Knight's Risk-Taking Theory
- Economic Theory of Entrepreneurship

- Exposure Theory of Entrepreneurship
- Political System Theory of Entrepreneurial Growth

Each theory offers distinct perspectives on how BI enhances SE, linking entrepreneurship, innovation, and sustainability.

Business Intelligence (BI) lowers risk, fosters innovation, boosts productivity, and enables managers to make strategic choices aligned with organizational missions (Parekh & Wright, 2024).

Building advanced IT infrastructures is essential to support technological innovation and **Green Knowledge Management (GKM)**, ensuring integration with management practices and enhancing sustainability initiatives (Al-Abbadi, Alshawabkeh, Alkhazali, Al-Aqrabawi, & Rumman, 2025).

Jordanian commercial banks face challenges in managing consumer preferences in a dynamic environment shaped by globalization, competition, and technological change. Organizations aligned with sustainable development must adapt performance measurement techniques, which involve complex structures and value judgments (Keeble et al., 2003).

Sustainability rests on three pillars—social, economic, and environmental—requiring efficient resource use to meet present and future needs (Nair & Nayar, 2020).

Strategic orientation elements—market, entrepreneurial, learning, and technology orientation—are critical for effective operations (Azaj et al., 2020).

Strategic management emphasizes monitoring internal and external conditions for rapid adaptation, particularly during crises such as global downturns. Organizational sustainability depends on maintaining unique competencies defined by durability and inimitability (Wheelen et al., 2018; David, 2011).

Empirical evidence supports the **Resource-Based View (RBV)**, showing that strategic orientations predict higher performance by shaping organizational capabilities and behaviors. Studies highlight market and entrepreneurial orientation as key contributors to competitive advantage (Kindermann et al., 2021).

Marketing literature further emphasizes that strategic orientation in market-driven organizations strongly influences performance, including the success of innovative products.

## **BI, improving supply chain performance, and sustainable marketing**

The exponential growth of data collection has transformed how organizations manage operations, make decisions, and interact with markets, **Business Intelligence (BI)** and analytics are now essential for improving marketing success and supply chain efficiency. Data-driven strategies enhance agility, resilience, and strategic accuracy in complex global value chains and dynamic customer environments.

BI, combined with descriptive, predictive, and prescriptive analytics, forms the backbone of intelligent enterprise systems.

The ability to convert large datasets into actionable insights is a vital competitive asset. In **Supply Chain Management (SCM)**, BI integration improves visibility across networks, including inventory control, supplier sourcing, customer fulfillment, and logistics. Predictive analytics, scenario simulations, and real-time dashboards have become central to execution and planning (Moinuddin & Usman, 2025).

In marketing, BI enables micro-segmentation, attrition forecasting, and automated personalized campaigns. According to **McKinsey (2021)**, advanced consumer analytics can increase acquisition rates by up to 20% and retention by 25%.

Empirical evidence shows that firms with high BI maturity achieve measurable gains in customer lifetime value and a 28% rise in marketing ROI.

The convergence of BI across supply chain and marketing domains—traditionally separate—creates integrated strategies.

Demand sensing improves when marketing insights inform inventory management and vice versa, reducing discrepancies between forecasts and actual consumption.

This feedback loop enhances coordinated planning and customer satisfaction. Research confirms that BI-driven integration across SCM and marketing correlates with observable performance advantages (Moinuddin & Usman, 2025).

Organizations in resource-constrained and ecologically fragile nations face pressure to balance digital transformation with sustainability.

**Business Intelligence (BI)** has become a vital decision-support tool, combining real-time analytics, predictive modeling, and visualization to enhance operational optimization, environmental adaptation, and responsiveness. Theoretically, BI facilitates sustainability-focused decision-making and improves **Environmental Performance (EP)** (Rahimnia & Molavi, 2021).

Most prior research has emphasized BI's financial and operational outcomes, with limited attention to environmental impacts, particularly in supply chains of developing markets (Huang, Savita, & Zhong-Jie, 2022).

BI can contribute to sustainability through environmental reporting, regulatory compliance, and resource efficiency, but empirical evidence on causal pathways remains scarce.

This gap is especially evident in Jordan, where industrial firms face environmental scrutiny alongside national digital transformation initiatives.

Despite frameworks such as **Jordan Vision** and the **Green Growth Plan**, empirical studies on BI's role in enabling EP within supply chains are limited (Dubey et al., 2019).

Operational mechanisms such as **Supply Chain Integration (SCI)** and **Green Supply Chain Management (GSCM)** are often proposed for sustainability, yet their mediating roles between BI and EP remain underexplored.

Similarly, **Blockchain Integration (BCI)**, promoted for transparency, is conceptually underexamined as a moderating factor that may strengthen BI's sustainability outcomes in institutionally constrained environments (Saberli et al., 2019).

This research emphasizes intra-organizational capabilities—BI, GSCM, and SCI—over compliance-driven dynamics, aligning with firm-level digital transformation objectives. In Jordan, the manufacturing sector contributes ~30% of GDP but has faced export declines of ~0.5% annually since 2010, largely due to environmental performance challenges.

These issues highlight the urgent need for sustainability-driven transformation to enhance competitiveness (Rawashdeh et al., 2024).

**Business Intelligence (BI)** is defined as a collection of tools that transform raw data into knowledge for strategic and operational decision-making, including analytics, real-time monitoring, and decision support.

BI enables organizations to evaluate, predict, and optimize environmental impacts by monitoring inefficiencies in resource use, emissions, and waste disposal (Filelis-Papadopoulos et al., 2024).

Recent studies highlight BI's role in diverse sectors. In healthcare, BI promotes resource and energy efficiency by dynamically adjusting operations based on data patterns.

In manufacturing, BI supports risk detection, process transparency, and compliance with environmental regulations (Benzidia et al., 2021).

These findings suggest BI can act as an intelligent sustainability enabler when embedded in core operations.

In Jordan and the wider MENA region, BI adoption is growing, but its use remains focused on financial and operational gains, with limited application in environmental decision-making.

BI is crucial for helping SMEs implement data-driven green strategies, though the environmental effects of these applications remain underexplored (Mbima & Tetteh, 2023).

While **Big Data Analytics (BDA)** is often linked to ecological optimization globally, more research is needed to understand how BI supports sustainable growth in Jordan's e-commerce sector, particularly through supply chain visibility and strategic forecasting. Conflicting findings exist regarding BI's ability to achieve environmental goals. According to Dubey et al. (2019), organizational inertia, technological misuse, or talent shortages may prevent BI from realizing its sustainability potential.

These inconsistencies highlight a theoretical and empirical gap, leaving unclear whether BI indirectly influences **Environmental Performance (EP)** through operational channels such as **Green Supply Chain Management (GSCM)** and **Supply Chain Integration (SCI)** (Dubey, Gunasekaran, Childe, Blome, & Papadopoulos, 2019).

**Supply Chain Integration (SCI)** coordinates internal processes and external connections to facilitate strategic collaboration.

SCI enhances environmental learning by promoting data exchange and real-time planning, enabling firms to meet legal requirements and reduce environmental impact. BI-derived insights can be converted into coordinated sustainability actions, harmonizing environmental plans across departments, suppliers, and distributors. Addressing SCI in its multifaceted form increases responsiveness and agility in sustainability contexts (Soares, Soltani, & Liao, 2017).

**Green Supply Chain Management (GSCM)** builds on SCI by embedding sustainability into procurement, manufacturing, logistics, and end-of-life product management. Research shows GSCM improves operational efficiency and compliance under environmental constraints, contributing to SDGs through waste reduction and eco-efficient logistics (Soares, Soltani, & Liao, 2017).

Empirical studies confirm GSCM's effectiveness in minimizing environmental damage and enhancing resilience.

Interactions between SCI and GSCM are increasingly studied in the context of digital technologies.

Collaboration is a prerequisite for green practices, with BI systems acting as enablers. Findings suggest a synergistic paradigm where BI catalyzes integration and greening. Organizations using BI report higher SCI levels and more rational GSCM practices, indicating SCI and GSCM may mediate BI's impact on **Environmental Performance (EP)** (Dubey, Gunasekaran, Childe, Blome, & Papadopoulos, 2019).

EP refers to measurable outcomes such as reduced emissions, waste, energy use, and improved resource efficiency. In Jordan, Al-Ghwayeen & Abdallah (2018) empirically demonstrated that GSCM practices and compliance are crucial EP indicators, including waste recovery and emissions control.

**Blockchain Integration (BCI)** enhances operational security, transparency, and efficiency by embedding blockchain into supply chains and business processes. Blockchain provides tamper-evident records, real-time data exchange, and reduced reliance on intermediaries. In supply chains, BCI improves sustainability reporting,

traceability, and authentication. However, challenges remain regarding scalability, regulation, and interoperability (Kamble, Gunasekaran, & Gawankar, 2020).

Recent research highlights that blockchain's strategic value can be enhanced when integrated with technologies such as the Internet of Things (IoT) and **Business Intelligence (BI)**.

Editorial perspectives emphasize BCI's role in balancing **Green Supply Chain Management (GSCM)** and **Environmental Performance (EP)** by ensuring reliable information dissemination, enabling sustainability-focused research and operational excellence.

This is particularly relevant in emerging economies like Jordan, where regulatory pressures and digital maturity are advancing simultaneously.

Literature supports the view that BCI and GSCM act as mechanisms through which BI insights generate tangible environmental benefits (Al-Hyassat & Ghasemi, 2025).

Organizations increasingly recognize the value of knowledge and information, investing heavily in enterprise systems such as **Supply Chain Management (SCM)**.

However, competitive advantage requires effective decision-making tools. BI has been acknowledged as a viable solution to meet demands for quick, relevant, and accessible information (Rouhani, Ashrafi, Ravasan, & Afshari, 2016).

The term **Business Intelligence (BI)** was first introduced by Howard Dresner in 1989 to describe methods, processes, and concepts for improving decision-making through evidence-based support systems.

BI has since gained popularity due to its role in enhancing efficiency and effectiveness at tactical, operational, and strategic levels (Arnott & Pervan, 2016).

The growing importance of BI is reflected in global expenditure on analytics and performance management software, which rose from \$10.5 billion to \$12.2 billion in 2011.

Despite this growth, literature reviews indicate that BI research approaches and categories remain underexplored.

Enhancing **Supply Chain (SC)** competitiveness is increasingly vital as rivalry shifts from single enterprises to **Supply Chain Systems (SSCs)**.

In today's economy, **SC agility**—the ability to respond quickly and effectively to turbulence and uncertainty—has become a critical component of competitiveness.

It enables firms to assemble assets, leverage knowledge, and form relationships rapidly, turning threats into opportunities (Aunyawong, Waiyawuththanapoom, Pintuma, & Sitthipo, 2020).

Although prior studies have examined the role of IT/IS in achieving agility, few have explored the link between **BI** and SC agility. This distinction is important because BI and IT/IS have unique implications.

Research aims to close this gap by examining the relationship between **SCBI competency** and SC agility.

SC agility can be analyzed from two perspectives:

- **Agile capabilities** (the ability to adapt and respond)
- **Agile performance** (the outcomes of agility)

Agile capabilities may act as a mediator between BI competence and agile SC performance.

Thus, empirical studies are needed to investigate how BI enhances organizational performance capabilities and strengthens SC agility (Aunyawong, Waiyawuththanapoom, Pintuma, & Sitthipo, 2020).

## 2.6 Previous Studies

- 1- **Business Intelligence and Its Vital Role in E-Commerce, (Verma & Sharma, 2021):** The study aims to offer a comprehensive review of AI in marketing using bibliometric, conceptual and intellectual network analysis of extant literature published between 1982 and 2020, its related to our study that AI-driven marketing empowers companies to make smarter, data-backed decisions, which is a core aspect of BI. This helps businesses grow sustainably by enhancing customer experiences, boosting sales, and expanding market reach in a more efficient way.

- 2- **The Role of Digital Transformation in Business: Opportunities, Challenges, and Future Directions, (Abu-ALSondos et al., 2024):** This study addresses the significance of digital transformation in the contemporary business environment, exploring its current state and anticipated future developments. In the first section of the article, the author defines digital transformation and emphasizes its significance for companies.
- 3- **Article Factors Influencing the Adoption of Big Data Analytics in the Digital Transformation Era: Case Study of Jordanian SMEs, (Lutfi et al., 2022):** This study primarily attempted to determine the drivers of big data analytics in the context of a developing economy, Jordan. The study examined the influence of technological, organizational and environmental factors on big data adoption in the Jordanian SMEs context
- 4- **Integration of Business Intelligence with e-commerce, (Ferreira, Pedrosa, & Bernardino, 2019):** This paper provides a survey of the most popular business intelligence and e-commerce open-source platforms and proposes architecture to combine e-commerce with business intelligence.
- 5- **The Role of Business Intelligence in Enhancing the Performance of Supply Chains in Jordan, (Ahmad Arikat, 2024):** The study represents the problem by the question: What is the role of business intelligence in enhancing the performance of supply chains in industrial companies in Jordan?
- 6- **Unlocking Sustainable Growth: The Role of Artificial Intelligence Adoption in Jordan Retail Sector, (Al-Ramahi et al., 2024):** The purpose of this study is to analyze how the adoption of Artificial Intelligence (AI) can drive sustainable growth in the retail sector in Jordan. It explores the ways in which AI technologies enhance business operations, improve decision-making processes, and contribute to long-term market expansion.
- 7- **The Role of Business Intelligence adoption as a Mediator of Big Data Analytics in the Management of Outsourced Reverse Supply Chain Operations, (Hatamlah, Allahham, Abu-ALSondos, Al-junaidi, Al-Anati, & Al-Shaikh, 2023):** The purpose of this study is to examine the role of Business Intelligence (BI) as a mediator in enhancing the effectiveness of Big Data

Analytics (BDA) within the management of Outsourced Reverse Supply Chain Operations.

- 8- **Business Intelligence and Strategic Entrepreneurship for Sustainable Development Goals (SDGs) Through Green Technology Innovation and Green Knowledge Management, (Al-Abbadi et al., 2025):** The study aimed to investigate the effect of business intelligence on strategic entrepreneurship and the mediating role of green technology innovation and the moderate role of green knowledge management for sustainable development goals (SDGs) in the Jordanian entrepreneur companies in King Hussein Business Park (KHBP).
- 9- **The Impact of BIS on Quality of Strategic Decision-Making, (Abu-ALSondos, 2023):** This study aims to investigate the impact of Business Intelligence Systems (BIS) on the quality of strategic decision-making in top-level management.
- 10- **Green Knowledge Management: A Key Driver of Green Technology Innovation and Sustainable Performance, (Khan, Mehmood, & Kwan, 2024):** The primary objective of this study is to examine the effects of green knowledge management (GKM) on green technological innovation (GTI) and sustainable performance in construction firms.
- 11- **Business Intelligence and Data Mining: Opportunities and Future, (Khder & Abu-ALSondos, 2021):** The main purpose of this study is to define the importance of business intelligence with its features, how data mining works and some data mining techniques discussed in brief, in addition to exploring the future and opportunities of Business Intelligence and Data Mining.
- 12- **Integration of Business Intelligence with E-commerce, (Ferreira, Pedrosa, & Bernardino, 2019):** This paper provides a survey of the most popular business intelligence and e-commerce open-source platforms and proposes architecture to combine e-commerce with business intelligence.
- 13- **Business Intelligence and Its Vital Role in E-Commerce, (Verma & Sharma, 2021):** The aim of this study is to evaluate how effective business intelligence play in e-commerce, Business Intelligence is an emerging area of study that involves the usage of big data to identify trends, patterns and form strategies for business.

- 14- ***Marketing intelligence in digital age: How business intelligence tools drive e-marketing strategies, (Shwawreh & Awamleh, 2025)***: The study aims to explore the interaction between marketing intelligence and business intelligence tools and their impact on e-marketing strategies in Jordanian companies such as Amazon, Marka VIP, and Khazanti.
- 15- ***E-commerce companies in Jordan (Al Dawoud, 2024)***: The main purpose of this study is to explore the growth, challenges, and opportunities of e-commerce companies in Jordan, with a particular focus on how local companies leverage digital platforms to expand market reach, improve operational efficiency, and enhance customer experiences. The study highlights the competitive landscape, regulatory environment, and infrastructural limitations impacting e-commerce development in Jordan (Al Dawoud, 2024).
- 16- ***The Impact of Digital Transformation on Sustainable Development in SMEs: The Case of Jordan (Al-Negrish & Almomani, 2024)***: This study aims to identify the impact of digital transformation on sustainable development within small and medium enterprises (SMEs) in Jordan. It examines the dimensions of economic, social, and environmental sustainability, analyzing how digital transformation initiatives influence growth, efficiency, and competitiveness in the Jordanian market. The study emphasizes the importance of adopting digital strategies for achieving long-term sustainability and resilience in the SME sector (Al-Negrish & Almomani, 2024).

### **Similarities, Differences, and Research Gap**

- **A review of prior studies reveals several points of convergence with the present research:** Many works emphasize the role of Business Intelligence (BI) and related technologies in enhancing competitiveness, decision-making, and sustainable growth.

For example, Verma & Sharma (2021) and Ferreira, Pedrosa, & Bernardino (2019) highlight BI's integration with e-commerce, while Abu-ALSondos (2023) and Ahmad Arikat (2024) examine BI's impact on strategic decision-making and supply chain performance in Jordan.

Similarly, Lutfi et al. (2022) and Al-Ramahi et al. (2024) explore the adoption of Big Data Analytics and Artificial Intelligence in Jordanian SMEs and retail, aligning with the current study's focus on digital transformation.

Moreover, Al-Abbadi et al. (2025) and Khan, Mehmood, & Kwan (2024) connect BI, Green Knowledge Management (GKM), and Green Technology Innovation (GTI) to the achievement of Sustainable Development Goals (SDGs), which resonates with this study's sustainability orientation.

- **Despite these overlaps, several differences distinguish the present research:** Prior studies often concentrate on financial performance, marketing, or operational efficiency (Verma & Sharma, 2021; Shwawreh & Awamleh, 2025), whereas this study extends BI's role to environmental performance (EP) and sustainability.

Existing works typically examine BI, AI, Big Data, GKM, or GTI individually or in limited combinations (Khder & Abu-AlSondos, 2021; Abu-AlSondos et al., 2024), while the current study integrates BI, Strategic Entrepreneurship (SE), GTI, GKM, Supply Chain Integration (SCI), and Blockchain Integration (BCI) into a unified framework.

Furthermore, much of the literature focuses on SMEs, retail, or e-commerce sectors (Al Dawoud, 2024; Al-Negrish & Almomani, 2024), whereas this study emphasizes the industrial and manufacturing sector in Jordan, which faces unique sustainability challenges and declining export performance.

Methodologically, many prior studies remain descriptive or conceptual (Arnott & Pervan, 2016; Rouhani et al., 2016), while the present research seeks empirical validation of BI's impact on sustainability outcomes through mediating and moderating mechanisms.

- **From this comparison, the research gap becomes clear:** While BI's contribution to financial and operational outcomes is well-documented, its causal impact on environmental performance and sustainability remains underexplored, particularly in developing economies such as Jordan.

Few studies have empirically tested the mediating role of SCI and GSCM, or the moderating role of BCI, in linking BI to sustainability outcomes.

Moreover, the industrial sector—representing a critical pillar of Jordan’s economy—has received limited attention compared to SMEs and retail, despite facing pressing environmental and competitiveness challenges.

Therefore, this study addresses the gap by empirically examining how BI, integrated with SE, GTI, GKM, SCI, and BCI, can drive sustainability and enhance environmental performance in Jordan’s industrial sector.

## **Chapter Three**

### **Study Methodology (Methods and Procedures)**

#### **3.1 Introduction**

This chapter details the methodological framework used to investigate the role of Business Intelligence (BI) in supporting the sustainable growth of e-commerce businesses in Jordan. It describes the study design, defines the target population and sampling techniques, outlines the data collection instruments, and explains the statistical procedures employed for data analysis.

#### **3.2 The Research Method**

The study adopts a descriptive-analytical approach. This method involves systematically collecting data to understand how BI technologies—specifically data collection, quality, integration, and mining—influence key performance indicators such as sales growth, market expansion, and operational efficiency. This approach is chosen to provide a clear and accurate understanding of the real impact of BI adoption within the Jordanian e-commerce sector.

#### **3.3 Study Population, Sample, and Unit of Analysis**

- **Study Population:** E-commerce companies operating in Jordan, including small, medium, and large firms that rely on digital platforms for commercial transactions.
- **Unit of Analysis:** Individuals directly involved in BI implementation and data-driven decision-making within these companies.
- **Target Respondents:** Managers, decision-makers, IT specialists, business analysts, and strategic planning personnel.
- **Sampling Method:** A purposive sampling technique was employed to ensure that participants possess the required professional knowledge and practical experience with BI systems.
- **Sample Size:** Following the committee's recommendation, the sample size was determined using the G-Power program, based on the number of independent and dependent variables, with parameters set at Power = 0.80 and  $\alpha = 0.05$ . The

analysis indicated that a minimum of 150 respondents is required to achieve statistical robustness.

- **Sample Distribution:** Since the study population is known and identifiable, the questionnaire was distributed proportionally across small, medium, and large e-commerce companies registered in Jordan.

### 3.4 Data Collection Methods

To achieve the research objectives, data was gathered from two primary sources:

- **Primary Data:** Collected directly from employees through a structured questionnaire designed to reflect the study's specific questions and hypotheses.
- **Secondary Data:** Obtained from academic articles, published papers, previous theses, case studies, and official reports related to BI and e-commerce.

### 3.5 Research Instrument (The Questionnaire)

- **Source of Items:** The questionnaire items were developed by adopting and adapting measures from validated studies (e.g., Verma & Sharma, 2021; Al-Abbadi et al., 2025; Khan et al., 2024), with modifications to fit the Jordanian e-commerce context.
- **Structure:**
  1. **Demographic Information:** Age, gender, educational background, role, years of experience, and company size.
  2. **Main Constructs:** Items measuring BI components, Strategic Entrepreneurship (SE), Green Technology Innovation (GTI), Green Knowledge Management (GKM), Supply Chain Integration (SCI), and Environmental Performance (EP).
- **Measurement Scale:** A five-point Likert scale ranging from *Strongly Disagree (1)* to *Strongly Agree (5)*.
- **Note:** The full questionnaire is provided in the appendix rather than in the main text.

### 3.6 Validity and Reliability

- **Validity:** Content validity was established by reviewing existing literature and prior validated studies. The instrument was also reviewed by academic experts to ensure the items correctly measure the intended constructs.
- **Reliability:** The reliability of the questionnaire was evaluated using the test-retest method and Spearman's correlation coefficients to ensure response stability over time.

### 3.7 Statistical Processing of Data

Data collected via Google Forms and printed copies were coded and analyzed using SPSS v.21. The following statistical techniques were applied:

1. **Descriptive Statistics:** Frequencies, percentages, means, and standard deviations for demographic and construct-related data.
2. **Correlation Analysis:** To examine the strength and direction of relationships between independent and dependent variables.
3. **Regression Analysis:** To test causal relationships and determine the impact of BI components on sustainable growth.
4. **Hypothesis Testing Criteria:**
  - If  $Sig. \leq 0.05 \rightarrow$  Reject the null hypothesis and accept the alternative.
  - If  $Sig. > 0.05 \rightarrow$  Accept the null hypothesis and reject the alternative.
5. **Relative Importance:** Classified as follows:
  - Low: 1.00 – 2.32
  - Medium: 2.33 – 3.66
  - High: 3.67 – 5.00

### 3.8 Ethical Considerations

The study ensured confidentiality of responses, voluntary participation, and informed consent. Data were used strictly for academic and research purposes.

## Chapter Four

### Results of the Study

#### 4.1 Introduction

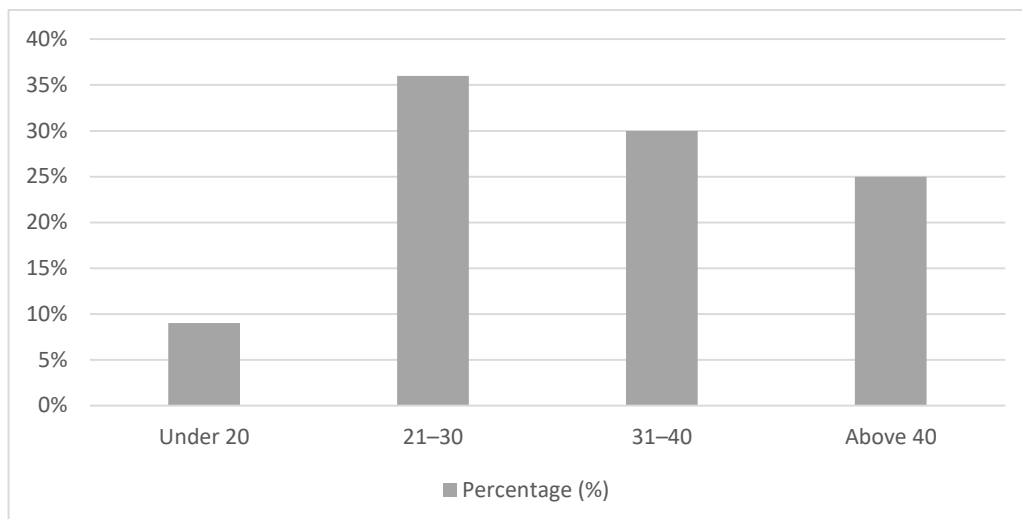
This chapter presents the empirical findings of the study based on the statistical analysis of data collected from 100 participants in the Jordanian e-commerce sector. The analysis provides a descriptive evaluation of each survey item across the four dimensions of Business Intelligence and their impact on sustainable growth.

##### 1. Age

**Table (4-1) and Figure (4-1)**, The results indicate that the 21–30 age group represents the largest percentage of participants at 36%, followed by the 31–40 age group at 30%. This reflects that the majority of the sample belong to age groups of working and professional activity, groups that possess the ability to work with information systems and make administrative decisions. The over-40 age group represents 25% of the total sample, indicating accumulated professional experience that contributes to enriching the study's findings. In contrast, the under-20 age group had a smaller percentage of 9%.

**Table 4-1 Percentage of sample individuals by gender and age**

Age Group	Number of Participants	Percentage (%)
<b>Under 20</b>	9	9%
<b>21–30</b>	36	36%
<b>31–40</b>	30	30%
<b>Above 40</b>	25	25%
<b>Total</b>	100	100%



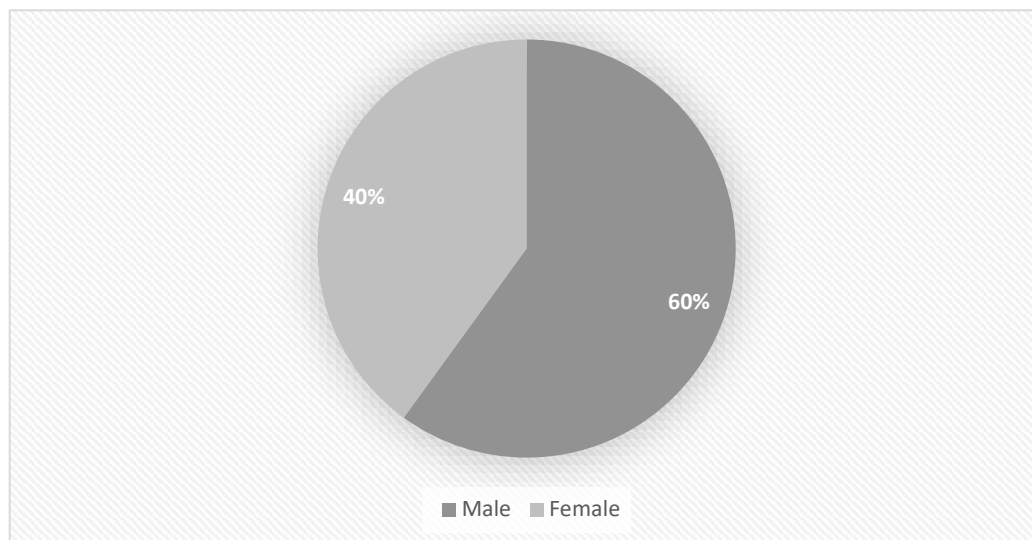
**Figure 4-1 Percentage of sample individuals by gender and age**

## 2. Gender

**Table (4-2) and Figure (4-2)** present the distribution of the study sample by gender. The total sample size for the study is 100 individuals, with males constituting 60% (60 individuals), while females represent 40% (40 individuals). This distribution reflects the actual participation structure of employees in e-commerce businesses in Jordan, where male representation is often higher in managerial and technical roles compared to females.

**Table 4-2 Number and percentage of sample members by gender**

Gender	Frequency (n)	Percentage (%)
Male	60	60%
Female	40	40%
Total	100	100%



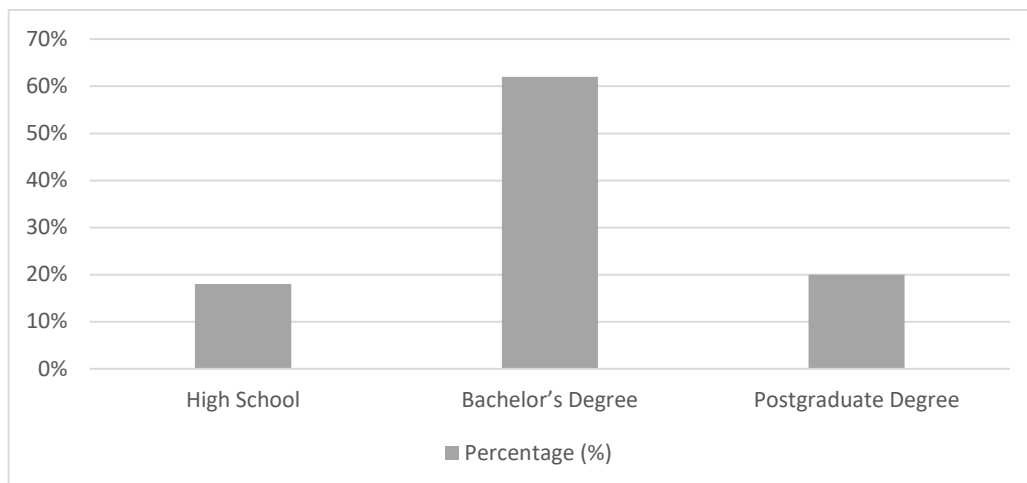
**Figure 4-2 Number and percentage of sample members by gender**

### 3. Educational Level

The data in Table (4-3) and Figure (4-3) show that the majority of the study sample (62%) holds a bachelor's degree, reflecting an educational level appropriate to the nature of the study, which focuses on the use of business intelligence systems and decision-making. Twenty percent hold postgraduate degrees, indicating the availability of academic and professional experience that supports the quality of responses. Eighteen percent hold a high school diploma, a relatively small percentage that aligns with the nature of the jobs studied.

**Table 4-3 Explaining the distribution of sample members according to academic qualification and gender**

<b>Educational Level</b>	<b>Number of Participants</b>	<b>Percentage (%)</b>
<b>High School</b>	18	18%
<b>Bachelor's Degree</b>	62	62%
<b>Postgraduate Degree</b>	20	20%
<b>Total</b>	<b>100</b>	<b>100%</b>



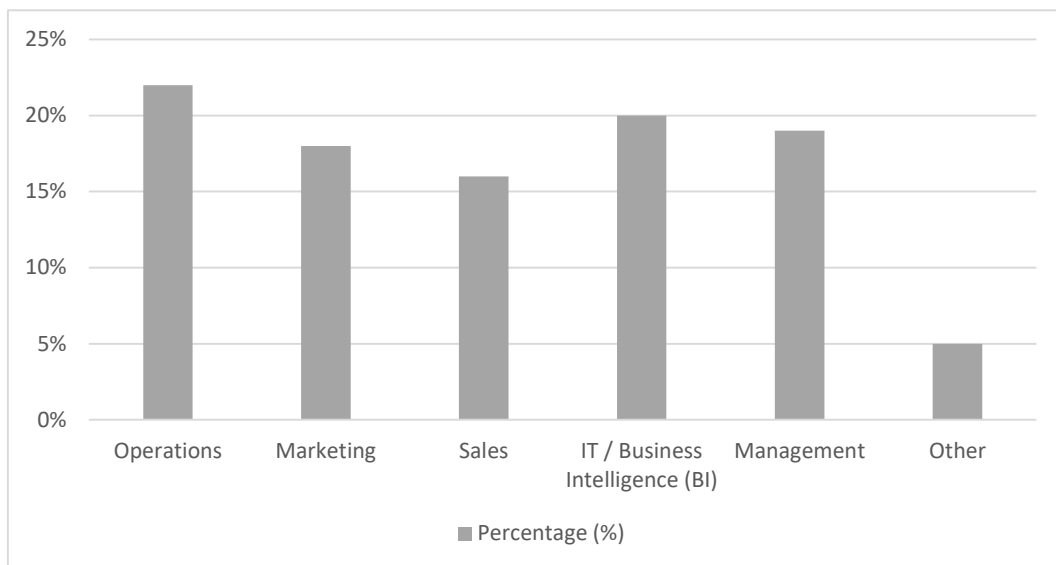
**Figure 4-3 Explaining the distribution of sample members according to academic qualification and gender**

#### **4. Current Position / Role**

The table (4-4) and Figure (4-4) illustrate the distribution of the study sample according to participants' current positions within their organizations. The results show a relatively balanced representation across key functional areas, with Operations accounting for 22% of the respondents, followed by IT/Business Intelligence (20%) and Management (19%). Marketing and Sales represent 18% and 16% of the sample, respectively, while 5% fall under other roles. This diversity in job roles enhances the reliability of the findings, as it reflects multiple organizational perspectives relevant to the implementation and impact of Business Intelligence systems on decision-making and sustainable growth.

**Table 4-4 Distribution of the Study Sample According to Current Position / Role**

<b>Current Position / Role</b>	<b>Number of Participants</b>	<b>Percentage (%)</b>
<b>Operations</b>	22	22%
<b>Marketing</b>	18	18%
<b>Sales</b>	16	16%
<b>IT / Business Intelligence (BI)</b>	20	20%
<b>Management</b>	19	19%
<b>Other</b>	5	5%
<b>Total</b>	<b>100</b>	<b>100%</b>



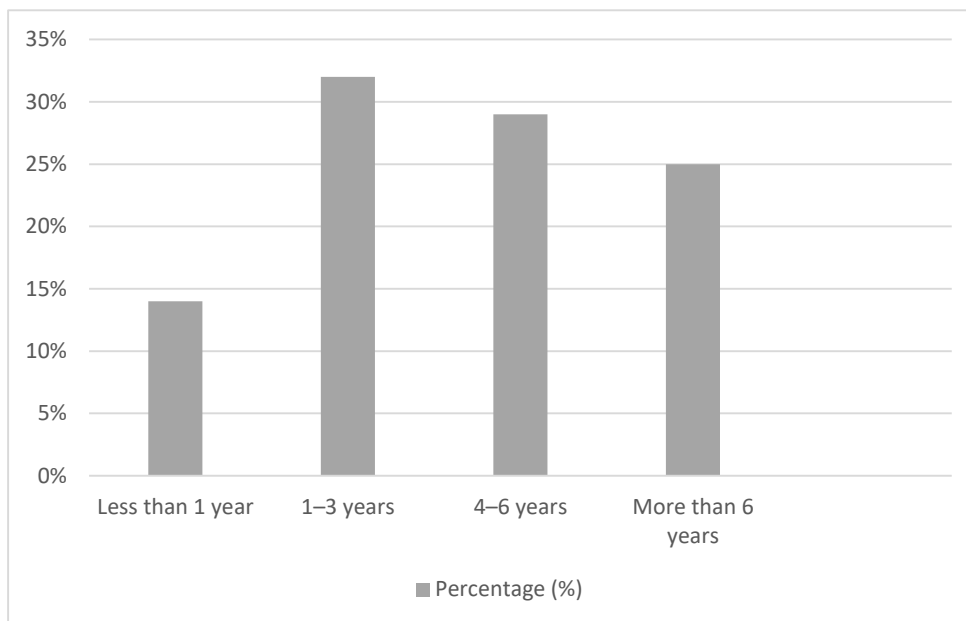
**Figure 4-4 Distribution of the Study Sample According to Current Position / Role**

### 5. Years of Experience in E-Commerce

The table (4-5) and figure (4-5) show that the majority of respondents possess moderate to high levels of experience in the e-commerce sector. Participants with 1–3 years of experience represent the largest group (32%), followed by those with 4–6 years (29%) and more than 6 years (25%). This distribution indicates that most respondents have sufficient practical experience to provide informed and reliable insights regarding the use of Business Intelligence systems and their impact on decision-making and sustainable growth in e-commerce businesses.

**Table 4-5 Distribution of the Study Sample According to Years of Experience in E-Commerce**

Years of Experience in E-Commerce	Frequency	Percentage (%)
Less than 1 year	14	14%
1–3 years	32	32%
4–6 years	29	29%
More than 6 years	25	25%
<b>Total</b>	<b>100</b>	<b>100%</b>



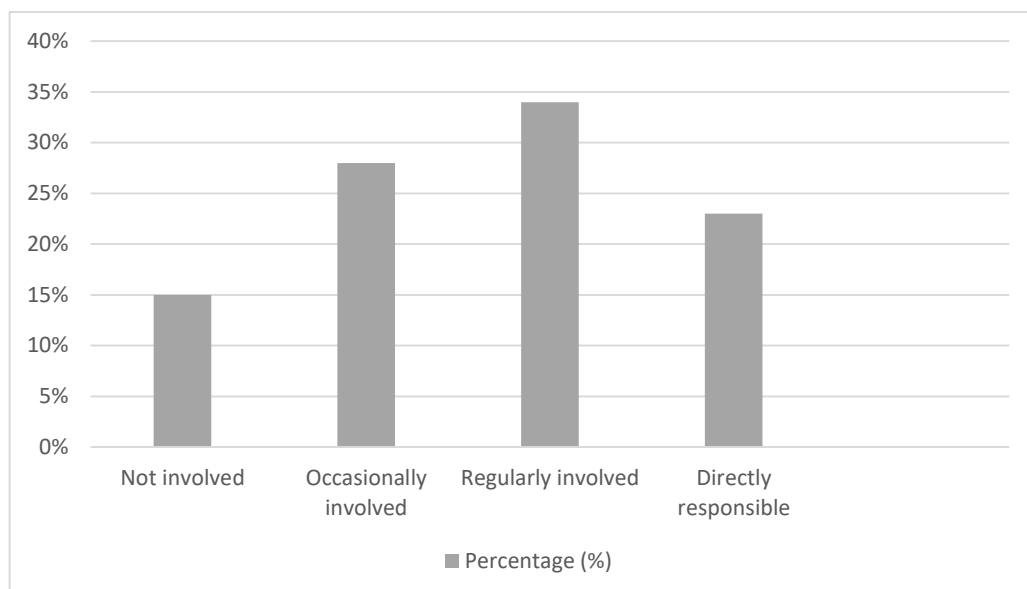
**Figure 4-5 Distribution of the Study Sample According to Years of Experience in E-Commerce**

## 6. Level of Involvement in Business Intelligence (BI)

The table (4-6) and figure (4-6) indicate that a substantial proportion of the respondents are actively engaged with Business Intelligence systems. Participants who are regularly involved or directly responsible for BI account for 57% of the sample, reflecting a strong level of familiarity and hands-on experience with BI tools. This enhances the credibility of the data collected, as respondents are well-positioned to evaluate the role of BI in supporting decision-making, operational efficiency, and sustainable growth in e-commerce businesses.

**Table 4-6 Distribution of the Study Sample According to Level of Involvement with Business Intelligence (BI)**

Level of Involvement with BI	Frequency	Percentage (%)
Not involved	15	15%
Occasionally involved	28	28%
Regularly involved	34	34%
Directly responsible	23	23%
<b>Total</b>	<b>100</b>	<b>100%</b>



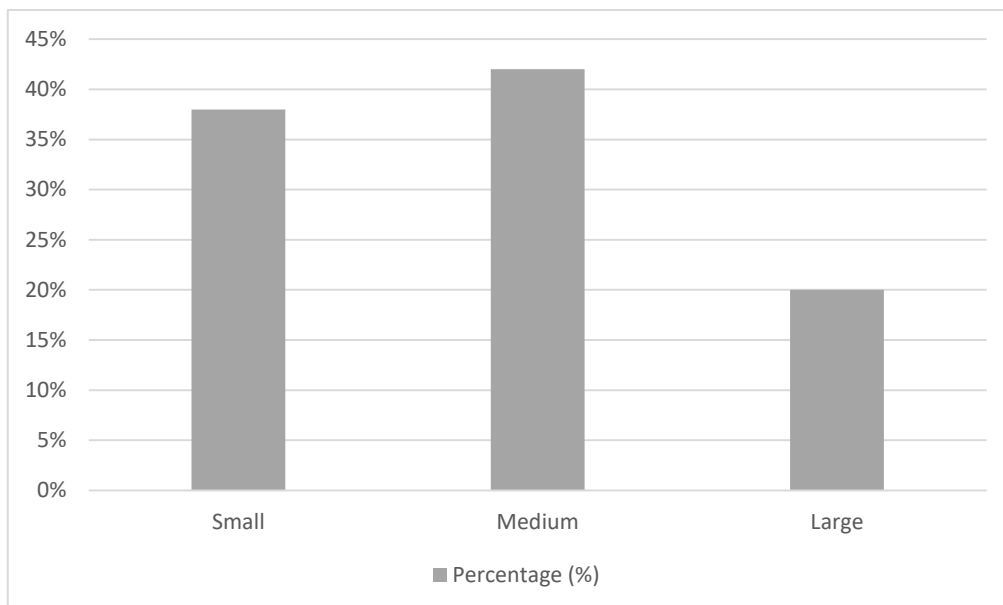
**Figure 4-6 Distribution of the Study Sample According to Level of Involvement with Business Intelligence (BI)**

## 7. Size of the E-Commerce Business

The table (4-7) and figure (4-7) show that the majority of the e-commerce businesses surveyed are small and medium-sized enterprises, representing 80% of the total sample. This reflects the actual structure of the e-commerce sector, which is largely dominated by SMEs. The presence of large companies (20%) provides additional insight into BI adoption across different organizational sizes, allowing for a more comprehensive analysis of how Business Intelligence contributes to sustainable growth in e-commerce businesses.

**Table 4-7 Distribution of the Study Sample According to the Size of the E-Commerce Business**

Size of the E-Commerce Business	Frequency	Percentage (%)
Small	38	38%
Medium	42	42%
Large	20	20%
<b>Total</b>	100	100%



**Figure 4-7 Distribution of the Study Sample According to the Size of the E-Commerce Business**

## **Section Two: Main Constructs and Dimensions**

Main Constructs and Dimensions focus on examining the core variables of the study related to Business Intelligence and its role in supporting sustainable growth in e-commerce businesses. This section is designed to capture respondents' perceptions of how BI systems and data management practices are implemented and utilized within their organizations.

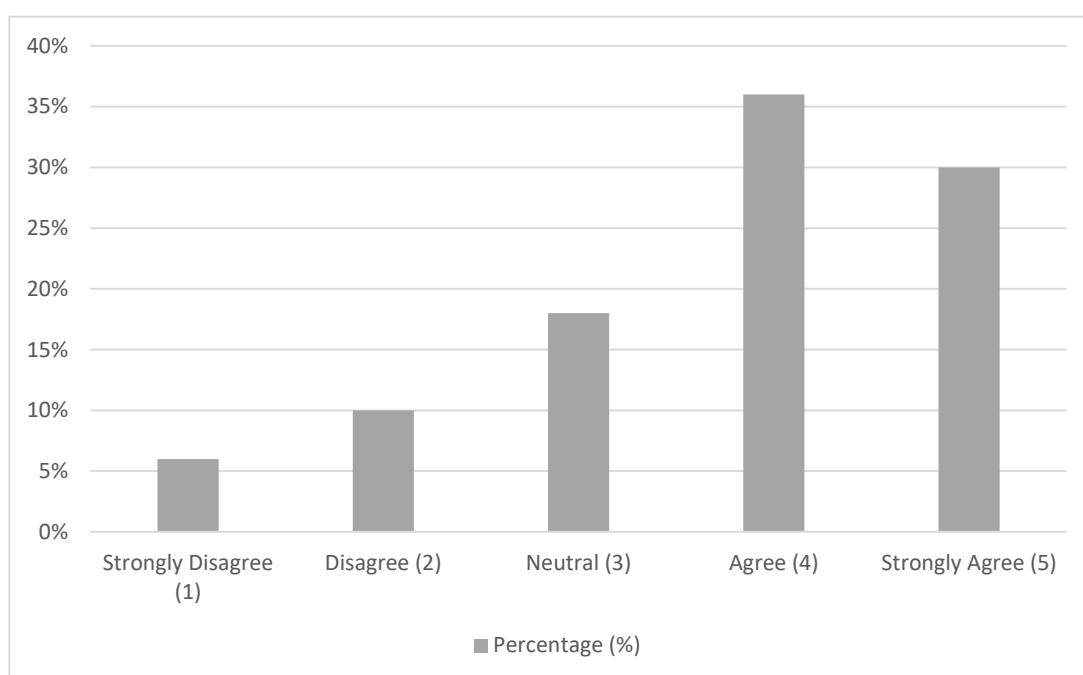
### **A. Business Intelligence Implementation (Main Hypothesis H<sub>1</sub>)**

**BII1: Our company effectively uses business intelligence tools to support managerial decision-making.**

**Table (4-8) and Figure (4-8)** show a generally positive view of the use of business intelligence in management decision-making, with 66% of participants expressing agreement or strong agreement. Only 16% disagreed, while 18% remained neutral, indicating a variation in the perceived effectiveness of business intelligence. Overall, the results suggest that the application of business intelligence plays a significant role in supporting the management decision-making process.

**Table 4-8 Responses to Statement (BII1)**

Likert Scale Response	Frequency	Percentage (%)
<b>Strongly Disagree (1)</b>	6	6%
<b>Disagree (2)</b>	10	10%
<b>Neutral (3)</b>	18	18%
<b>Agree (4)</b>	36	36%
<b>Strongly Agree (5)</b>	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>

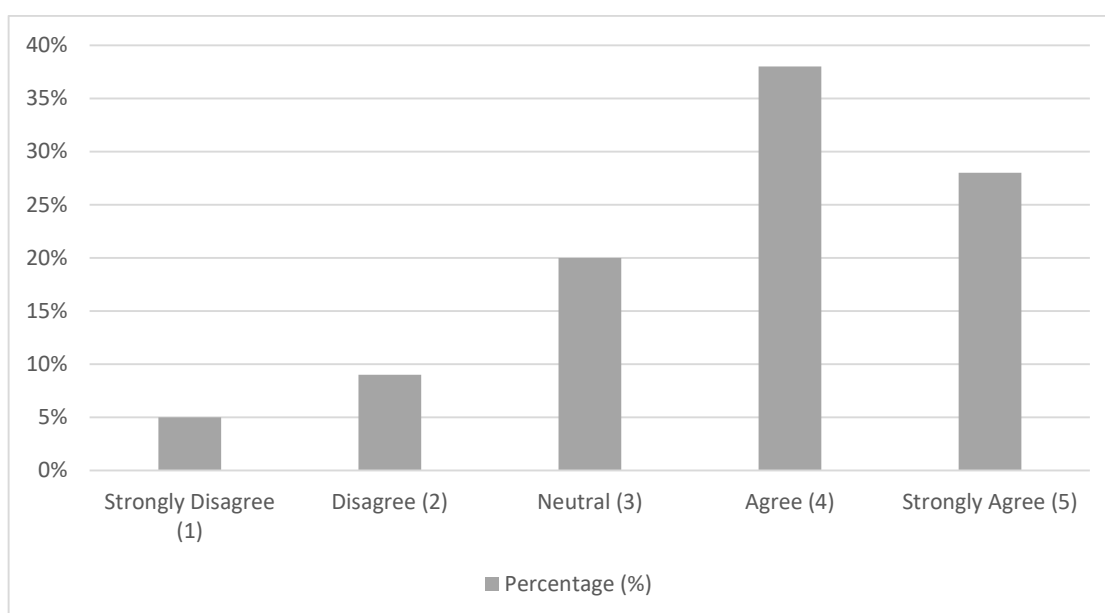
**Figure 4-8 Responses to Statement (BII1)**

**BII2: Business intelligence helps identify growth opportunities in our e-commerce operations.**

**Table (4-9) and Figure (4-9)** show that the majority of participants (66%) believe that business intelligence is effective in identifying growth opportunities in e-commerce operations. A smaller percentage (14%) disagreed, while 20% remained neutral. These results indicate that business intelligence is generally viewed as a valuable tool for identifying strategic growth opportunities in the surveyed organizations.

**Table 4-9 Responses to Statement (BII2)**

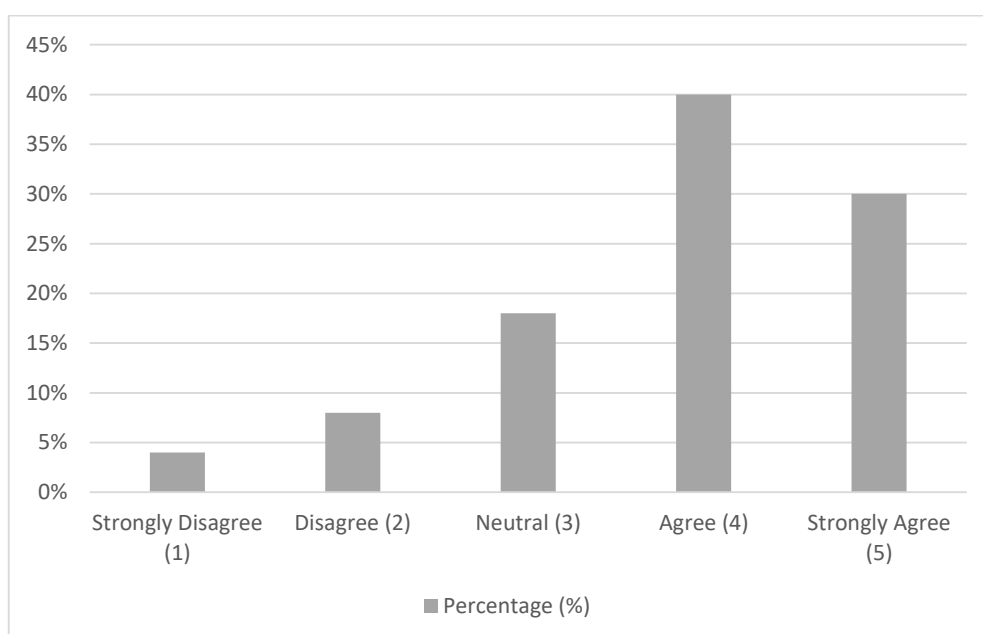
Likert Scale Response	Frequency	Percentage (%)
<b>Strongly Disagree (1)</b>	5	5%
<b>Disagree (2)</b>	9	9%
<b>Neutral (3)</b>	20	20%
<b>Agree (4)</b>	38	38%
<b>Strongly Agree (5)</b>	28	28%
<b>Total</b>	<b>100</b>	<b>100%</b>

**Figure 4-9 Responses to Statement (BII2)****BII3: BI tools improve the efficiency of internal operational processes.**

**Table (4-10) and Figure (4-10)** show that the majority of participants (70%) agree or strongly agree that business intelligence tools improve the efficiency of internal operational processes. Only 12% disagreed, while 18% remained neutral. These results indicate that the application of business intelligence is generally effective in improving operational efficiency within the surveyed organizations.

**Table 4-10 Responses to Statement (BII3)**

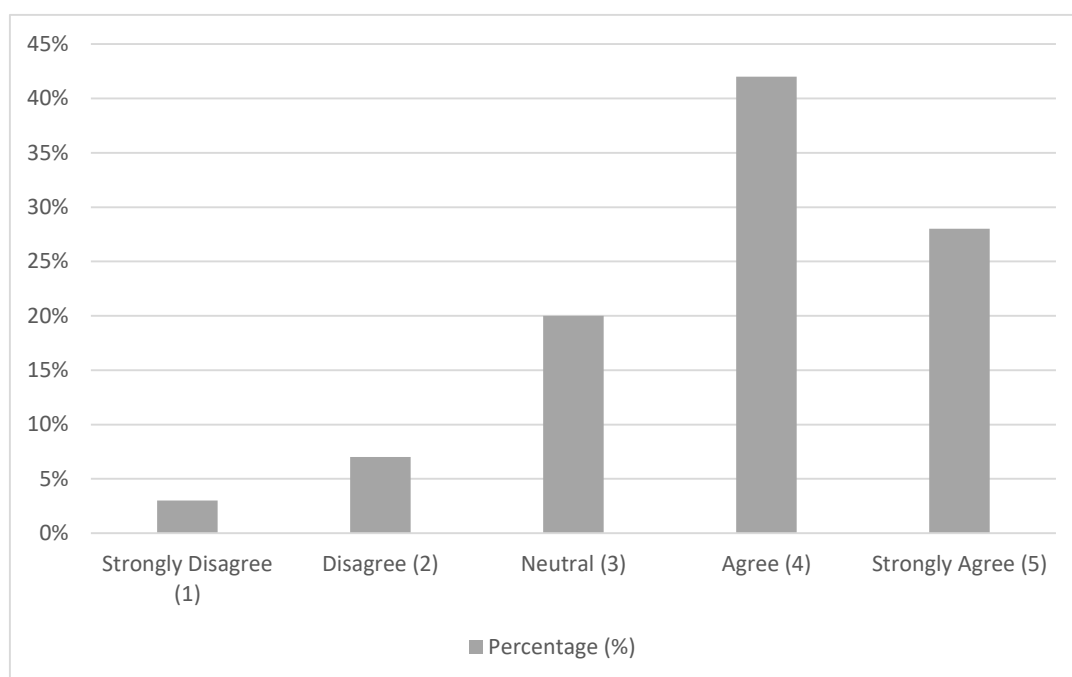
Likert Scale Response	Frequency	Percentage (%)
<b>Strongly Disagree (1)</b>	4	4%
<b>Disagree (2)</b>	8	8%
<b>Neutral (3)</b>	18	18%
<b>Agree (4)</b>	40	40%
<b>Strongly Agree (5)</b>	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>

**Figure 4-10 Responses to Statement (BII3)****BII4: BI systems provide accurate and timely information for strategic planning.**

**Table (4-11) and Figure (4-11)** show that 70% of participants agree or strongly agree that business intelligence systems provide accurate and timely information for strategic planning. Only 10% disagreed, while 20% remained neutral. This indicates that business intelligence systems are generally considered reliable tools for supporting informed strategic decision-making within the surveyed organizations.

**Table 4-11 Responses to Statement (BII4)**

Likert Scale Response	Frequency	Percentage (%)
<b>Strongly Disagree (1)</b>	3	3%
<b>Disagree (2)</b>	7	7%
<b>Neutral (3)</b>	20	20%
<b>Agree (4)</b>	42	42%
<b>Strongly Agree (5)</b>	28	28%
<b>Total</b>	<b>100</b>	<b>100%</b>

**Figure 4-11 Responses to Statement (BII4)**

**BII5 Business intelligence contributes to the long-term sustainable growth of our e-commerce business.**

Table (4-12) and Figure (4-12) show that the majority of participants (72%) agree or strongly agree that business intelligence contributes to the long-term sustainable growth of their e-commerce businesses. Only 10% disagreed, while 18% remained neutral. These results indicate that business intelligence is widely considered a key driver of sustainable growth and long-term strategic success in the surveyed organizations.

Table 4-12 Responses to Statement (BII5)

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	4	4%
Disagree (2)	6	6%
Neutral (3)	18	18%
Agree (4)	38	38%
Strongly Agree (5)	34	34%
<b>Total</b>	<b>100</b>	<b>100%</b>

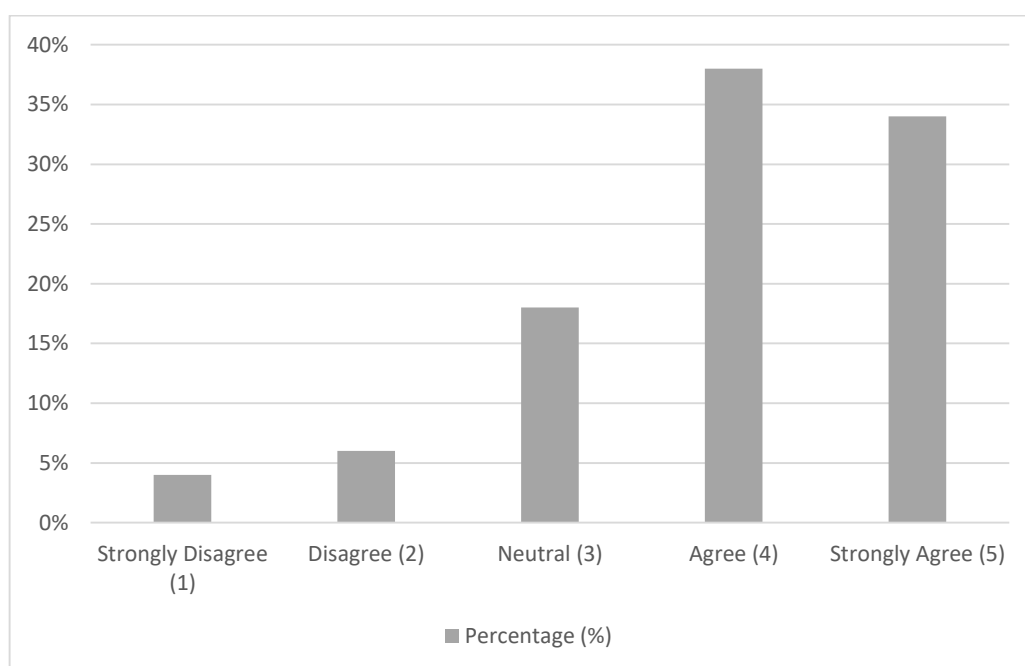


Figure 4-12 Responses to Statement (BII5)

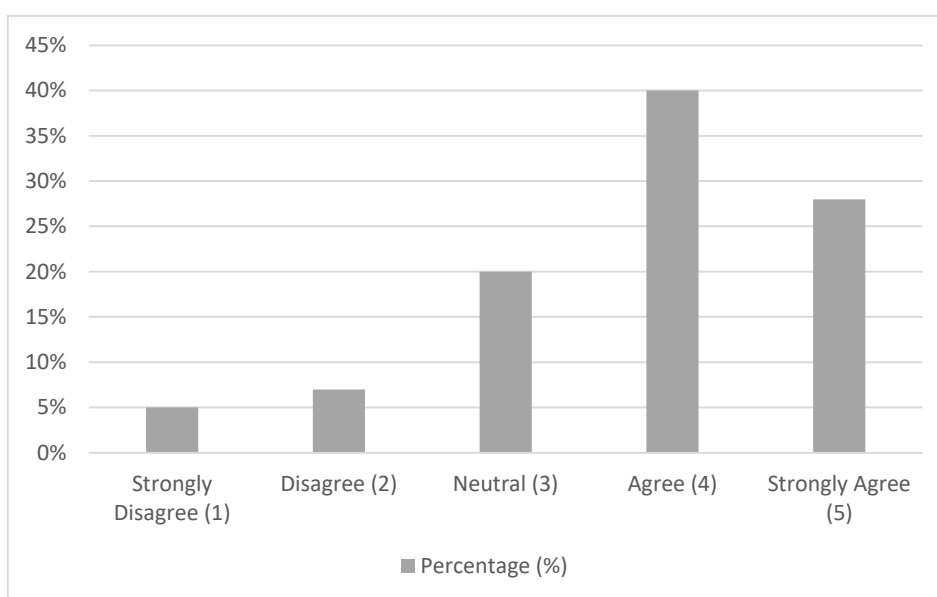
## B. Data Collection (H<sub>1a</sub>)

### DC1: Our company systematically collects data from various e-commerce activities.

Table (4-13) and Figure (4-13) indicate that 68% of survey participants agree or strongly agree that their companies systematically collect data from various e-commerce activities. In contrast, only 12% disagreed, while 20% remained neutral. This demonstrates that systematic data collection is widely practiced, providing a reliable basis for data-driven decision-making within the surveyed organizations.

**Table 4-13 Responses to Statement (DC1)**

Likert Scale Response	Frequency	Percentage (%)
<b>Strongly Disagree (1)</b>	5	5%
<b>Disagree (2)</b>	7	7%
<b>Neutral (3)</b>	20	20%
<b>Agree (4)</b>	40	40%
<b>Strongly Agree (5)</b>	28	28%
<b>Total</b>	<b>100</b>	<b>100%</b>

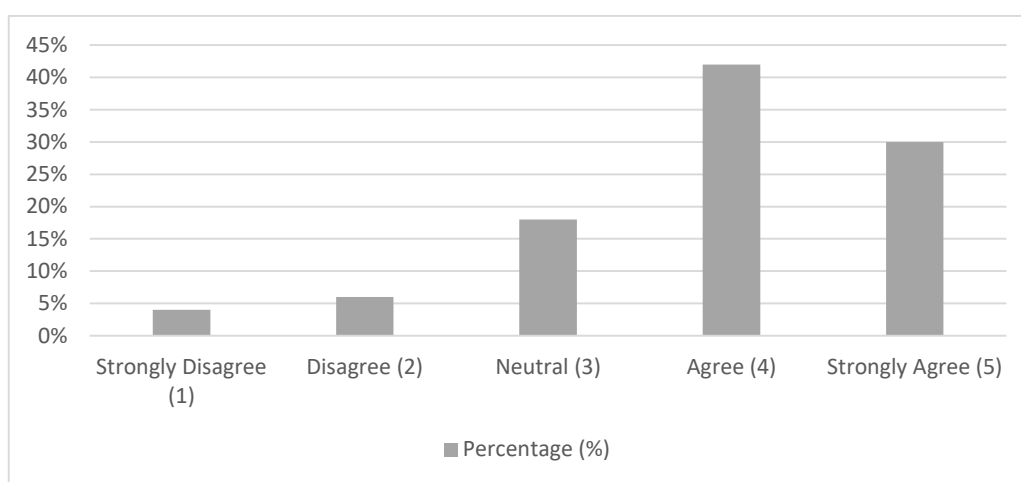
**Figure 4-13 Responses to Statement (DC1)**

**DC2: The data collected is relevant and useful for business decision-making.**

**Table (4-14) and Figure (4-14)** show that 72% of participants believe the collected data is relevant and useful for business decision-making. Only 10% disagreed, while 18% remained neutral. This confirms that organizations generally value data, which supports effective decision-making processes.

**Table 4-14 Responses to Statement (DC2)**

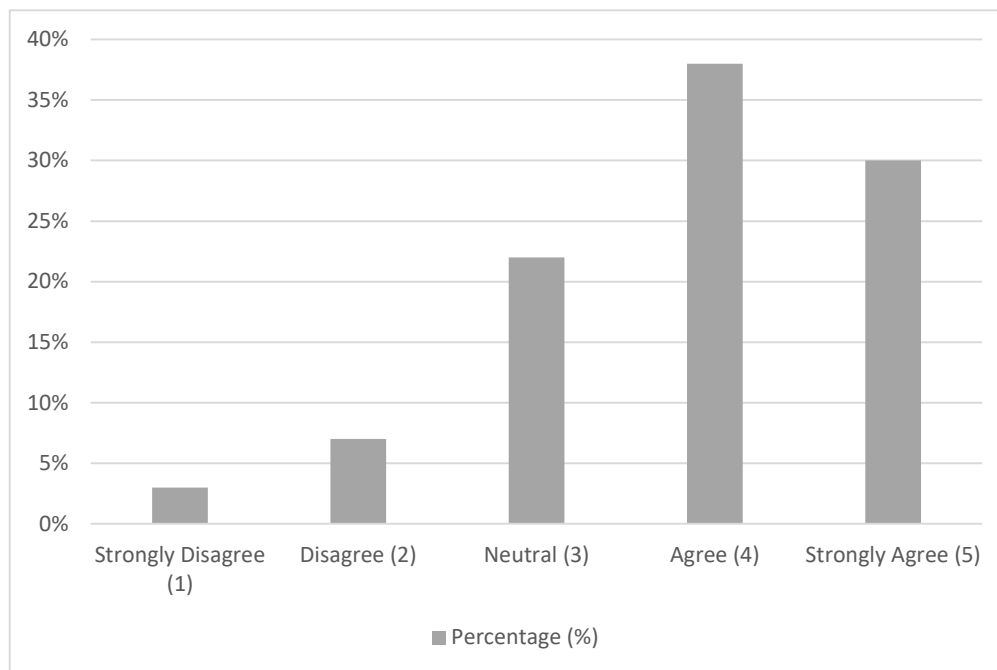
Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	4	4%
Disagree (2)	6	6%
Neutral (3)	18	18%
Agree (4)	42	42%
Strongly Agree (5)	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>

**Figure 4-14 Responses to Statement (DC2)****DC3: Data collection processes help identify customer trends and preferences.**

**Table (4-15) and Figure (4-15)** show that 68% of participants agree or strongly agree that data collection effectively contributes to identifying customer trends and preferences. A small percentage (10%) disagreed, while 22% remained neutral. This indicates that the surveyed organizations generally benefit from data collection to understand customer behavior, which supports informed decision-making and strategic planning.

**Table 4-15 Responses to Statement (DC3)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	3	3%
Disagree (2)	7	7%
Neutral (3)	22	22%
Agree (4)	38	38%
Strongly Agree (5)	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>



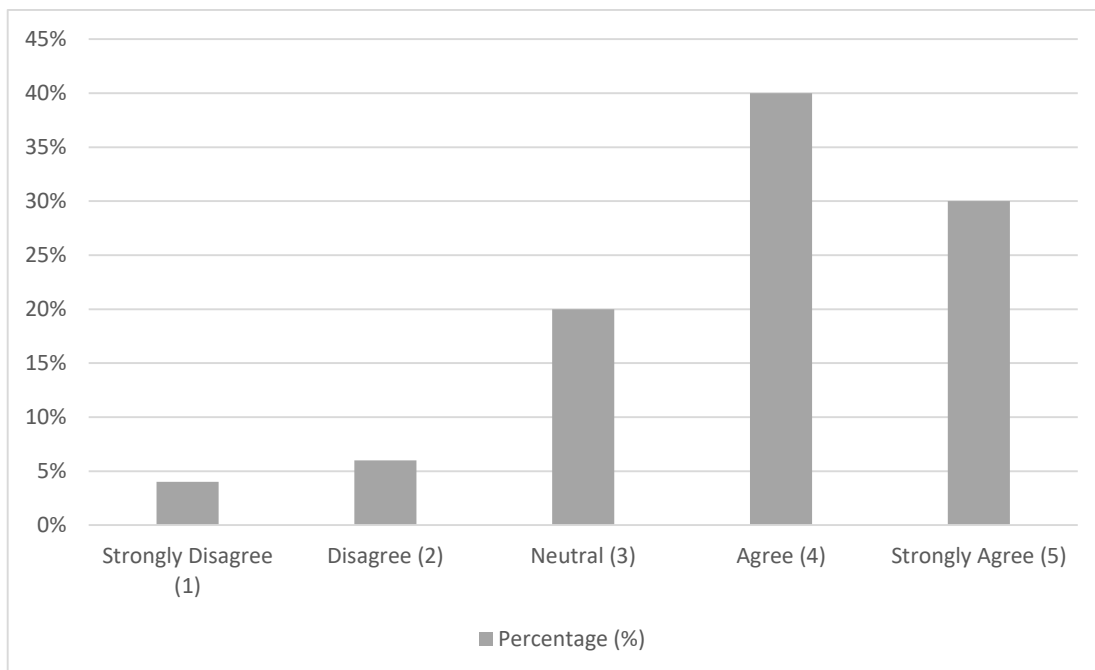
**Figure 4-15 Responses to Statement (DC3)**

**DC4: Collected data supports strategic planning and sustainable growth initiatives.**

**Table (4-16) and Figure (4-16)** show that 70% of participants agree or strongly agree that collected data supports strategic planning and sustainable growth initiatives. Only 10% disagreed, while 20% remained neutral. This indicates that data collection practices are generally effective in providing a basis for strategic decision-making and long-term organizational growth.

**Table 4-16 Responses to Statement (DC4)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	4	4%
Disagree (2)	6	6%
Neutral (3)	20	20%
Agree (4)	40	40%
Strongly Agree (5)	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>



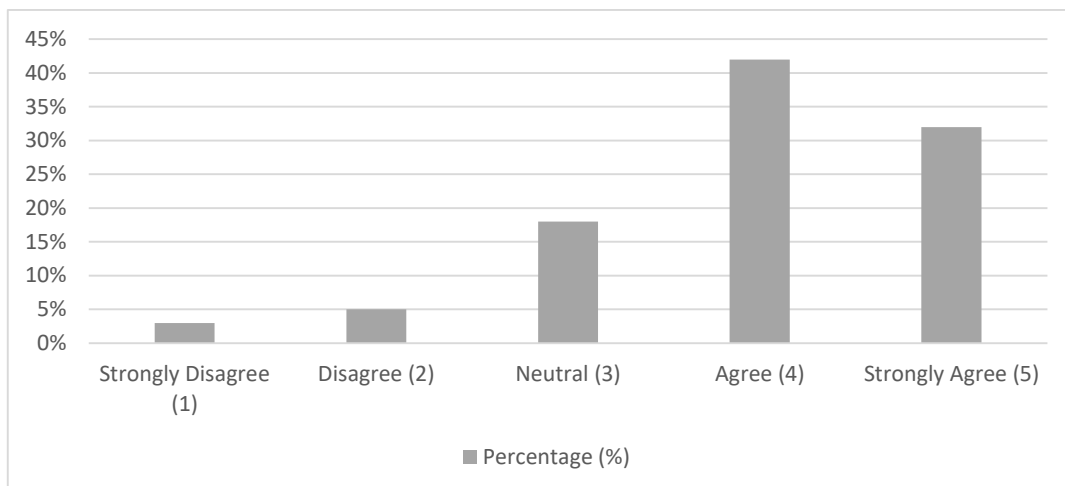
**Figure 4-16 Responses to Statement (DC4)**

**DC5: The company regularly monitors and tracks key business performance metrics.**

The Table (4-17) and Figure (4-17) shows that 74% of respondents agree or strongly agree that their company regularly monitors and tracks key business performance metrics. Only 8% expressed disagreement, while 18% remained neutral. These findings suggest that consistent performance monitoring is a common practice, supporting effective data-driven management and strategic decision-making within the surveyed organizations.

**Table 4-17 Responses to Statement (DC5)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	3	3%
Disagree (2)	5	5%
Neutral (3)	18	18%
Agree (4)	42	42%
Strongly Agree (5)	32	32%
<b>Total</b>	<b>100</b>	<b>100%</b>



**Figure 4-17 Responses to Statement (DC5)**

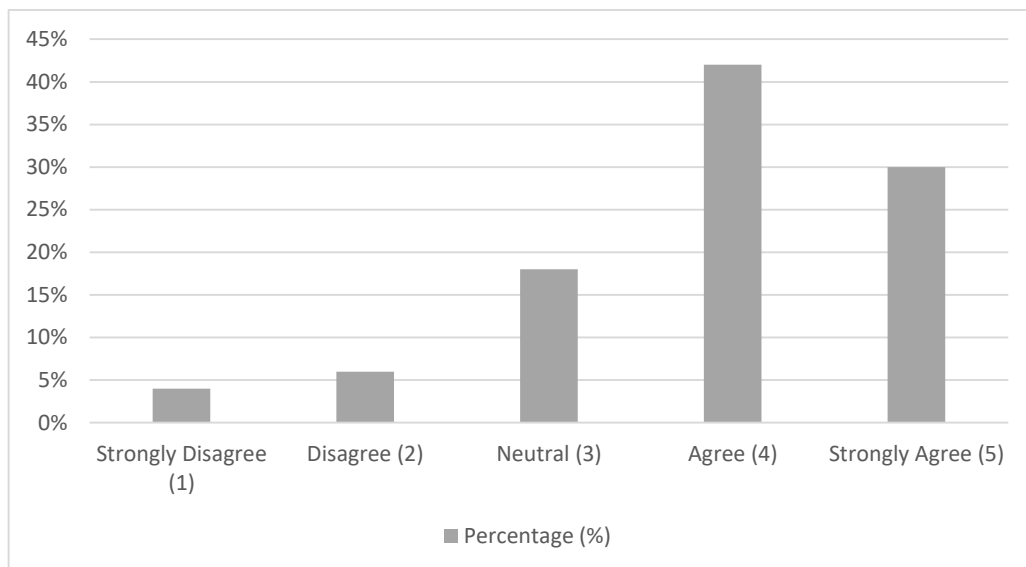
### **A. Data Quality (H1b)**

#### **DQ1: The data used in our company is accurate and reliable.**

The results shown in **Table (4-18) and Figure (4-18)** indicate that 72% of participants agree or strongly agree that the data used in their companies is accurate and reliable. Only 10% disagreed, while 18% remained neutral. This suggests that data quality is generally maintained at a high level, providing a solid foundation for informed decision-making and effective business intelligence practices.

**Table 4-18 Responses to Statement (DQ1)**

<b>Likert Scale Response</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Strongly Disagree (1)</b>	4	4%
<b>Disagree (2)</b>	6	6%
<b>Neutral (3)</b>	18	18%
<b>Agree (4)</b>	42	42%
<b>Strongly Agree (5)</b>	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>



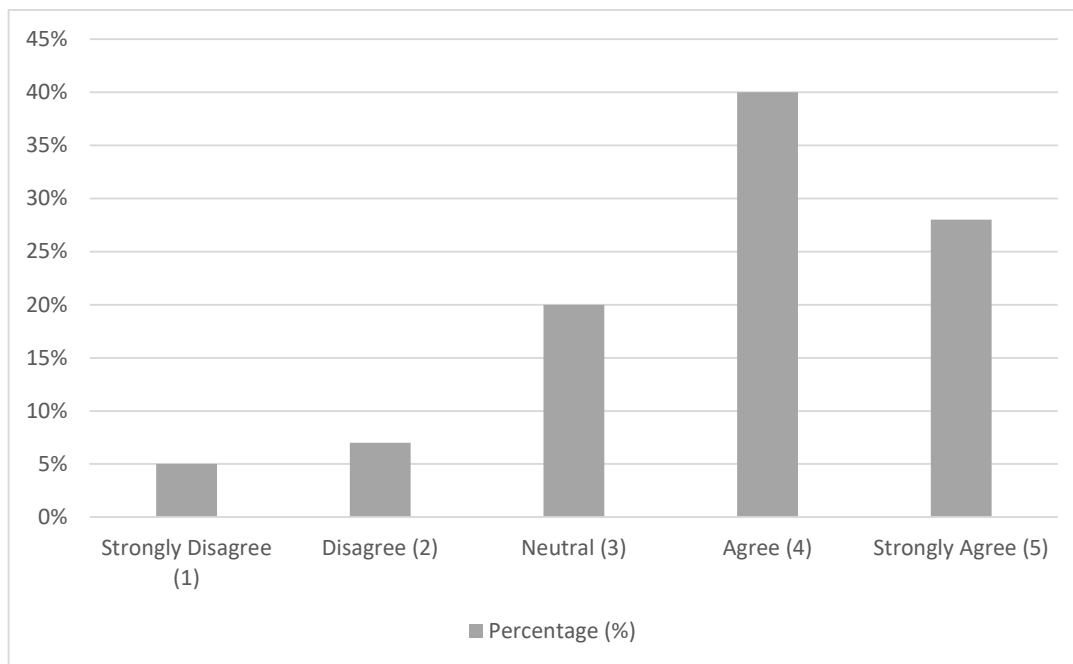
**Figure 4-18 Responses to Statement (DQ1)**

**DQ2: Data used for decision-making is complete and up to date.**

Table ( 4-19) and Figure (4-19) show that 68% of respondents agree or strongly agree that the data used in decision-making is complete and up-to-date. Only 12% disagree, while 20% remained neutral. This indicates that the surveyed organizations generally ensure complete and up-to-date data, which supports effective decision-making and accurate business analysis.

**Table 4-19 Responses to Statement (DQ2)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	5	5%
Disagree (2)	7	7%
Neutral (3)	20	20%
Agree (4)	40	40%
Strongly Agree (5)	28	28%
<b>Total</b>	<b>100</b>	<b>100%</b>



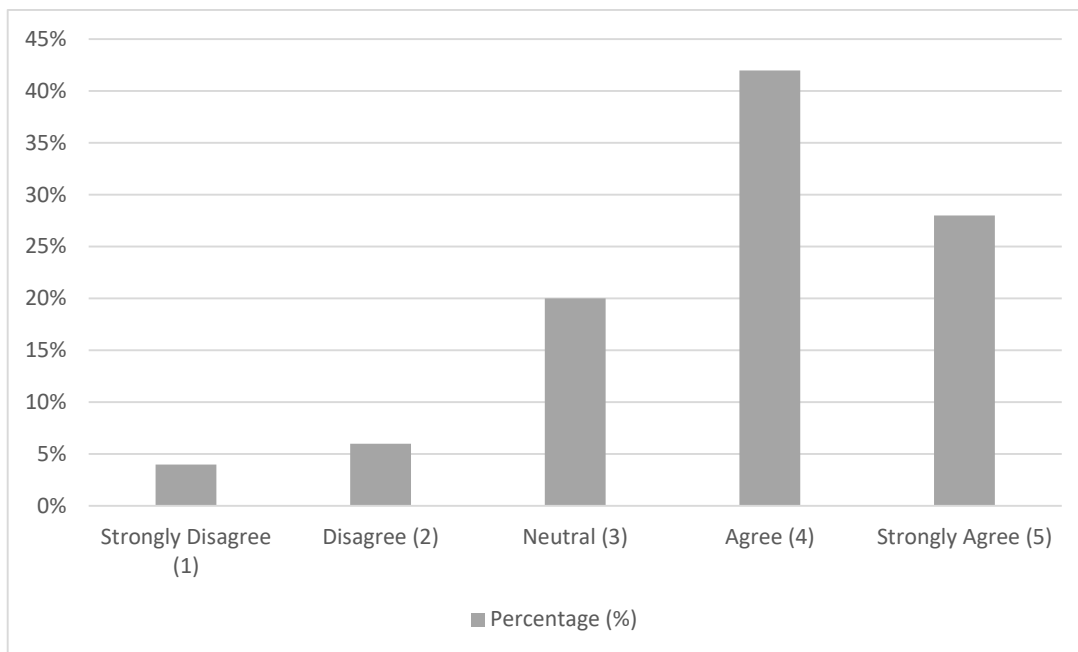
**Figure 4-19 Responses to Statement (DQ2)**

**DQ3: Our company regularly validates and verifies data accuracy.**

Table (4-20) and Figure (4-20) indicates that 70% of respondents agree or strongly agree that their company regularly validates and verifies data accuracy. Only 10% expressed disagreement, while 20% remained neutral. This reflects a strong organizational commitment to maintaining high data quality standards, which is essential for reliable business intelligence and informed decision-making.

**Table 4-20 Responses to Statement (DQ3)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	4	4%
Disagree (2)	6	6%
Neutral (3)	20	20%
Agree (4)	42	42%
Strongly Agree (5)	28	28%
<b>Total</b>	<b>100</b>	<b>100%</b>



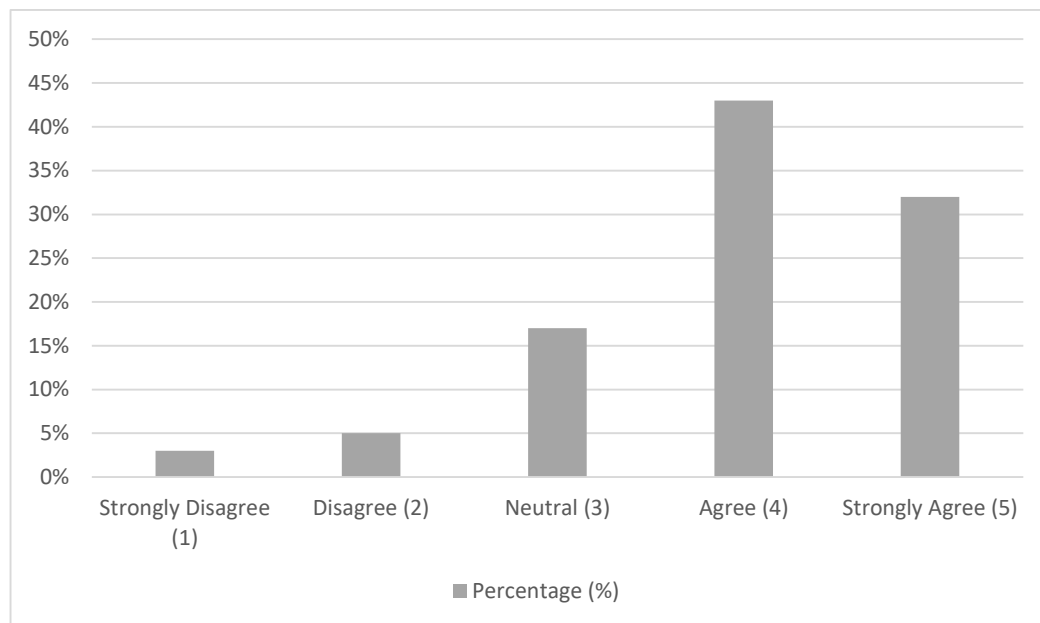
**Figure 4-20 Responses to Statement (DQ3)**

**DQ4: High-quality data improves the quality of business insights and analyses.**

**Table (4-21) and Figure (4-21)** show that 75% of participants agree or strongly agree that high-quality data improves the quality of business insights and analytics. Only 8% disagreed, while 17% remained neutral. This highlights the pivotal role of data quality in generating valuable insights that support strategic decision-making and operational efficiency.

**Table 4-21 Responses to Statement (DQ4)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	3	3%
Disagree (2)	5	5%
Neutral (3)	17	17%
Agree (4)	43	43%
Strongly Agree (5)	32	32%
<b>Total</b>	<b>100</b>	<b>100%</b>



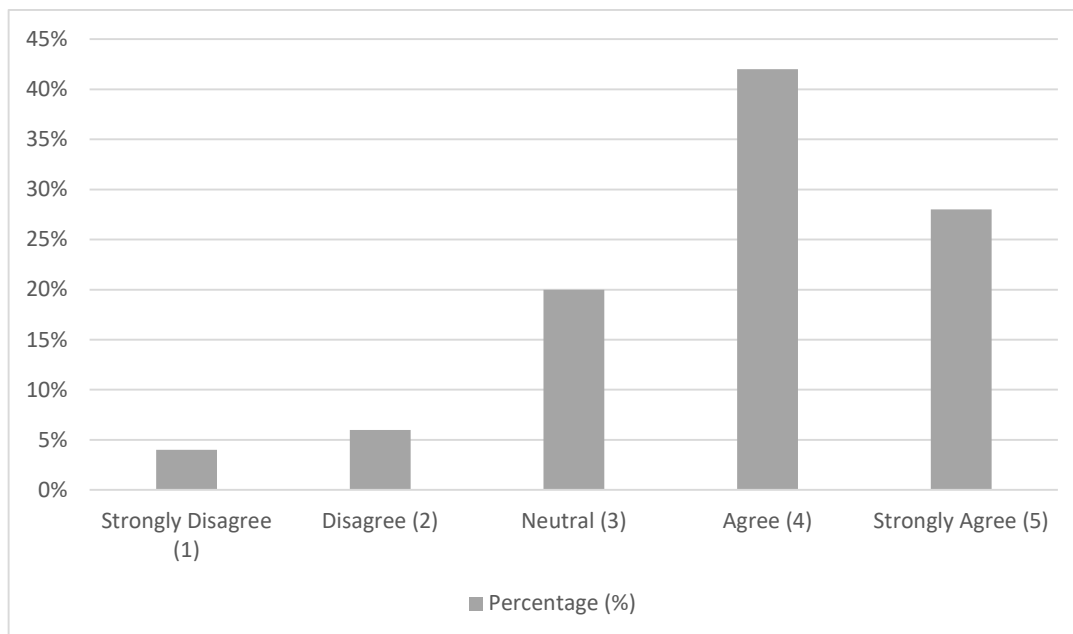
**Figure 4-21 Responses to Statement (DQ4)**

**DQ5: Data inconsistencies or errors are identified and corrected promptly.**

The Table (4-22) and Figure (4-22) show that 70% of respondents agree or strongly agree that data inconsistencies or errors are promptly identified and corrected. Only 10% expressed disagreement, while 20% remained neutral. This indicates that the surveyed organizations maintain effective mechanisms for ensuring data integrity, which is essential for accurate analyses and informed decision-making.

**Table 4-22 Responses to Statement (DQ5)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	4	4%
Disagree (2)	6	6%
Neutral (3)	20	20%
Agree (4)	42	42%
Strongly Agree (5)	28	28%
<b>Total</b>	<b>100</b>	<b>100%</b>



**Figure 4-22 Responses to Statement (DQ5)**

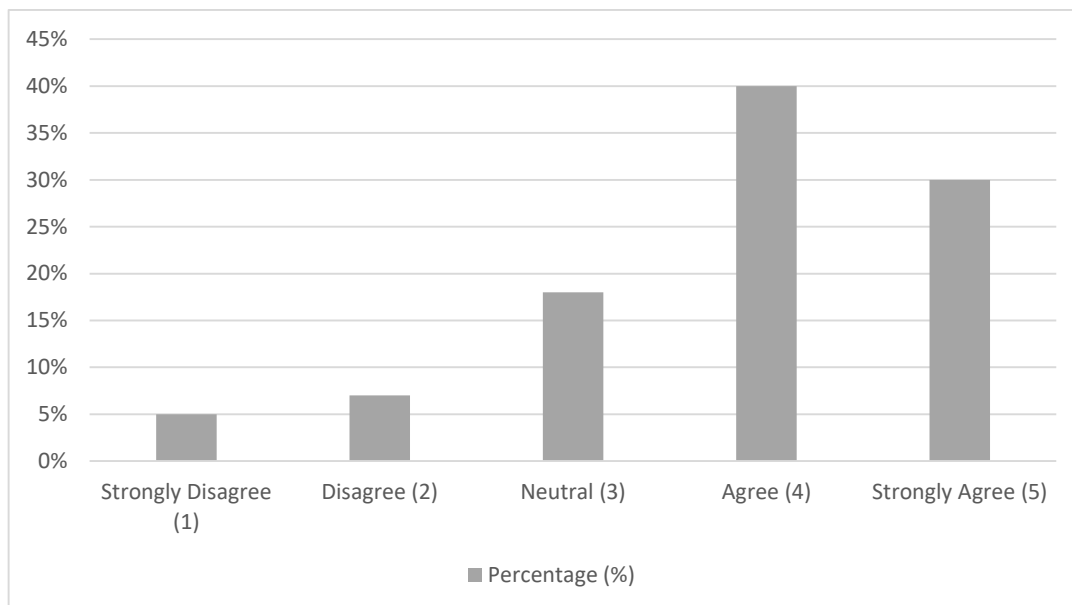
## **B. Data Integration (H<sub>1c</sub>)**

### **DI1: Data from different departments within the company is efficiently integrated.**

**Table (4-23) and Figure (4-23)** show that 70% of participants agree or strongly agree with the efficiency of data integration from different departments. Only 12% disagreed, while 18% remained neutral. This indicates that data integration between departments is a common practice, supporting coordinated decision-making and enhancing organizational efficiency.

**Table 4-23 Responses to Statement (DI1)**

<b>Likert Scale Response</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Strongly Disagree (1)</b>	5	5%
<b>Disagree (2)</b>	7	7%
<b>Neutral (3)</b>	18	18%
<b>Agree (4)</b>	40	40%
<b>Strongly Agree (5)</b>	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>



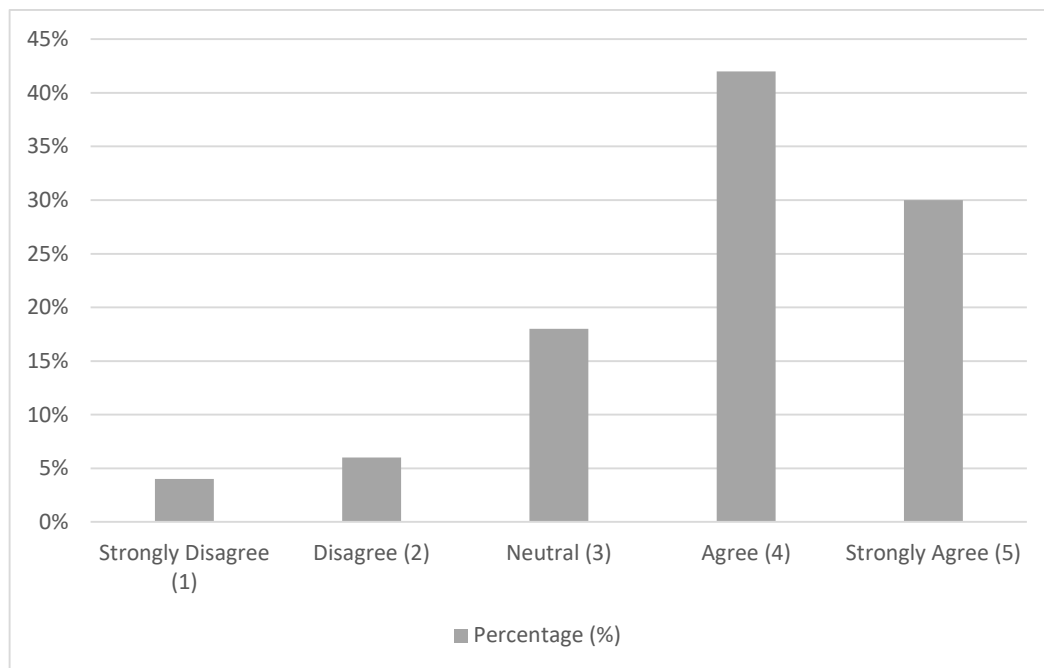
**Figure 4-23 Responses to Statement (DI1)**

**DI2: BI systems combine data from multiple sources into a unified platform.**

Table (4-24) and Figure (4-24) show that 72% of participants agree or strongly agree that business intelligence systems successfully aggregate data from multiple sources into a unified platform. Only 10% disagreed, while 18% remained neutral. This demonstrates the effectiveness of business intelligence systems in integrating enterprise data to support comprehensive decision-making and strategic planning.

**Table 4-24 Responses to Statement (DI2)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	4	4%
Disagree (2)	6	6%
Neutral (3)	18	18%
Agree (4)	42	42%
Strongly Agree (5)	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>



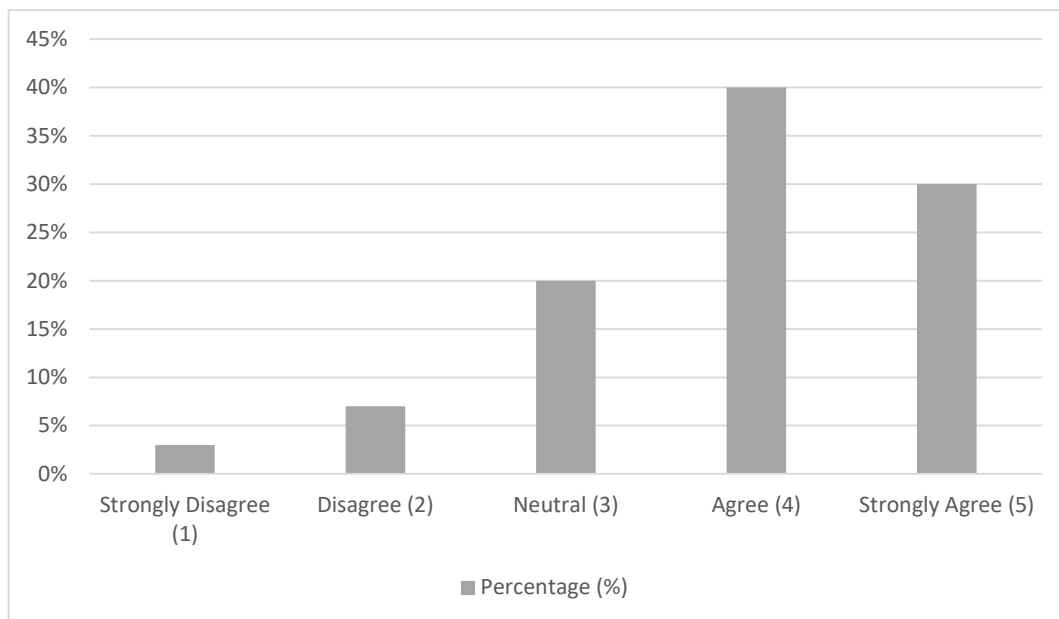
**Figure 4-24 Responses to Statement (DI2)**

**DI3: Integrated data supports cross-functional decision-making.**

Table (4-25) and Figure (4-25) show that 70% of responses strongly agree that integrated data facilitates decision-making. Meanwhile, 10% of responses remained on the original record, and 20% on neutral data. This makes sense, as data integration, which promotes collaboration across services, enables more accurate and better-coordinated organizational decisions.

**Table 4-25 Responses to Statement (DI3)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	3	3%
Disagree (2)	7	7%
Neutral (3)	20	20%
Agree (4)	40	40%
Strongly Agree (5)	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>



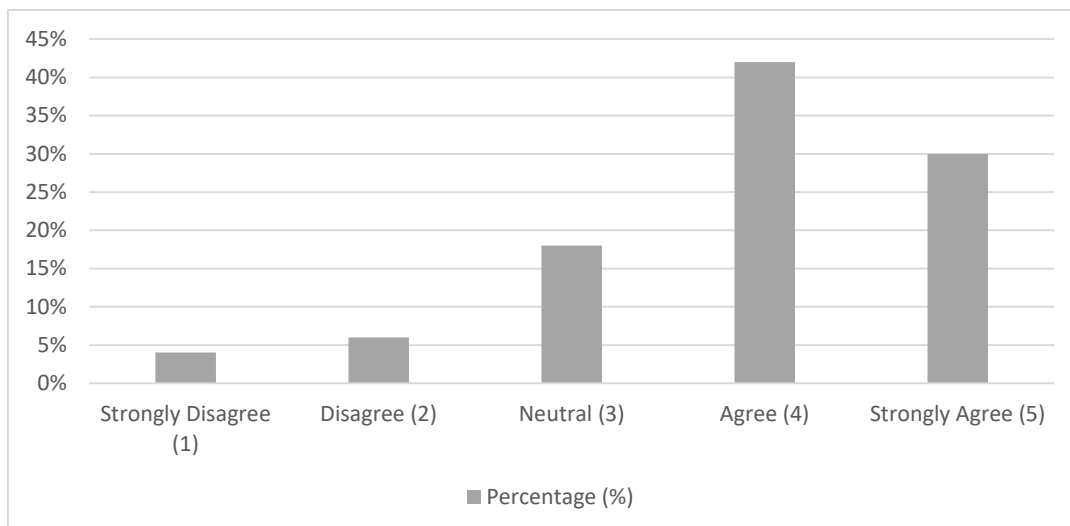
**Figure 4-25 Responses to Statement (DI3)**

**DI4: Data integration improves operational efficiency and coordination.**

Table (4-26) and Figure (4-26) indicate that 72% of participants agree or strongly agree that data integration improves operational efficiency and coordination. Only 10% disagreed, while 18% remained neutral. This demonstrates that effective data integration across departments significantly contributes to streamlining processes and improving organizational performance.

**Table 4-26 Responses to Statement (DI4)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	4	4%
Disagree (2)	6	6%
Neutral (3)	18	18%
Agree (4)	42	42%
Strongly Agree (5)	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>



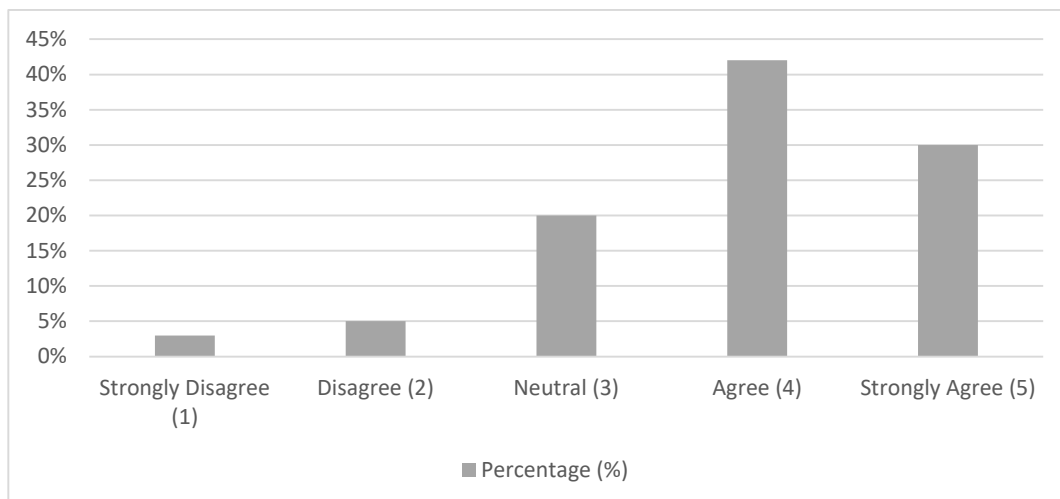
**Figure 4-26 Responses to Statement (DI4)**

**DI5: Integrated data is effectively used for strategic planning and sustainable growth.**

Table (4-27) and Figure (4-27) show that 72% of participants agree or strongly agree that integrated data is used effectively in strategic planning and sustainable growth. Only 8% disagreed, while 20% remained neutral. This indicates that organizations are leveraging integrated data in strategic decision-making, which supports long-term growth and competitive advantage.

**Table 4-27 Responses to Statement (DI5)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	3	3%
Disagree (2)	5	5%
Neutral (3)	20	20%
Agree (4)	42	42%
Strongly Agree (5)	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>



**Figure 4-27 Responses to Statement (DI5)**

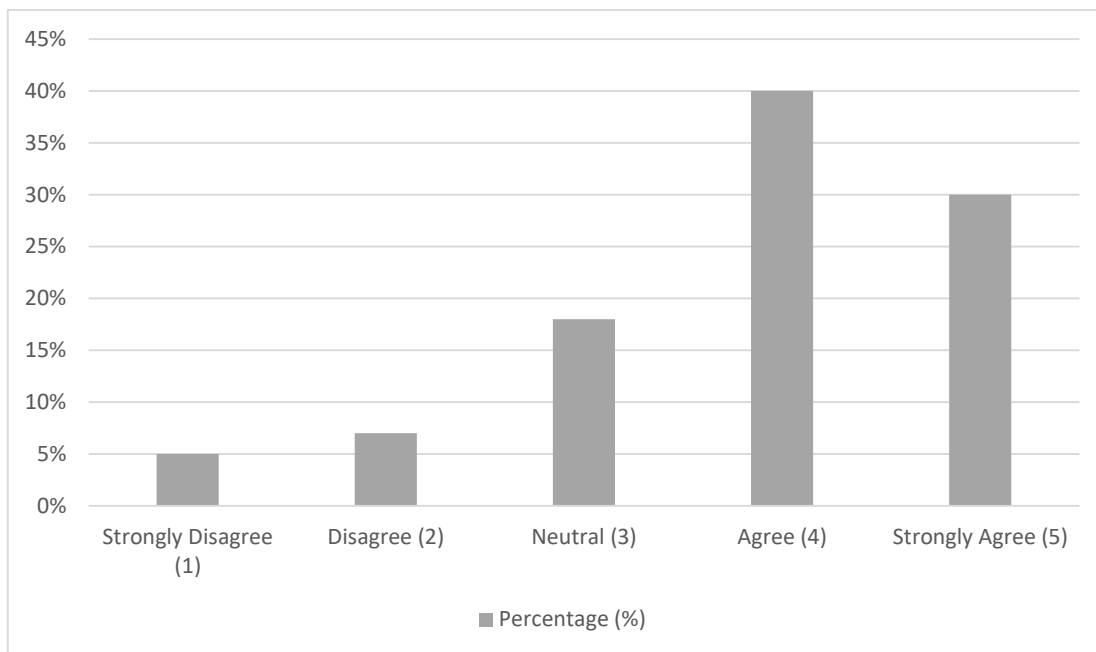
### C. Data Mining (H<sub>1d</sub>)

**DM1: Our company uses data mining tools to identify patterns in customer behavior.**

**Table (4-28) and Figure (4-28)** indicate that 70% of participants agree or strongly agree that their companies use data mining tools to identify customer behavior patterns. In contrast, only 12% disagreed, while 18% remained neutral. This demonstrates that data mining is widely used to understand customer trends, thereby improving decision-making and marketing strategies.

**Table 4-28 Responses to Statement (DM1)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	5	5%
Disagree (2)	7	7%
Neutral (3)	18	18%
Agree (4)	40	40%
Strongly Agree (5)	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>



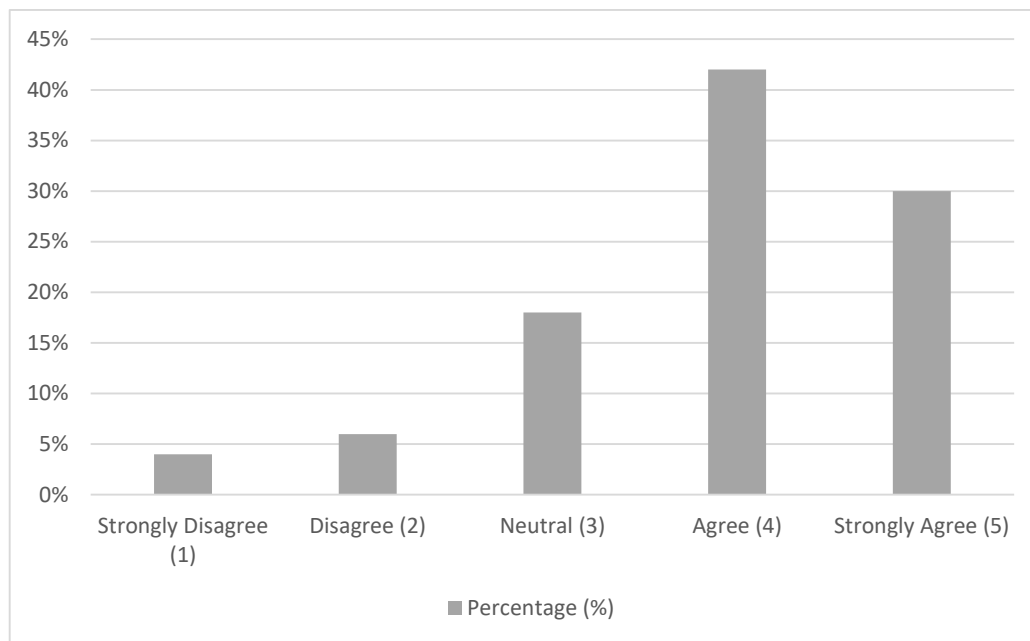
**Figure 4-28 Responses to Statement (DM1)**

**DM2: Data mining techniques help identify opportunities for business growth.**

Table (4-29) and Figure (4-29) show that 72% of participants agree or strongly agree that data mining techniques help identify business growth opportunities. Only 10% disagreed, while 18% remained neutral. This highlights the important role of data mining in uncovering actionable insights that support strategic expansion and competitive advantage.

**Table 4-29 Responses to Statement (DM2)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	4	4%
Disagree (2)	6	6%
Neutral (3)	18	18%
Agree (4)	42	42%
Strongly Agree (5)	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>



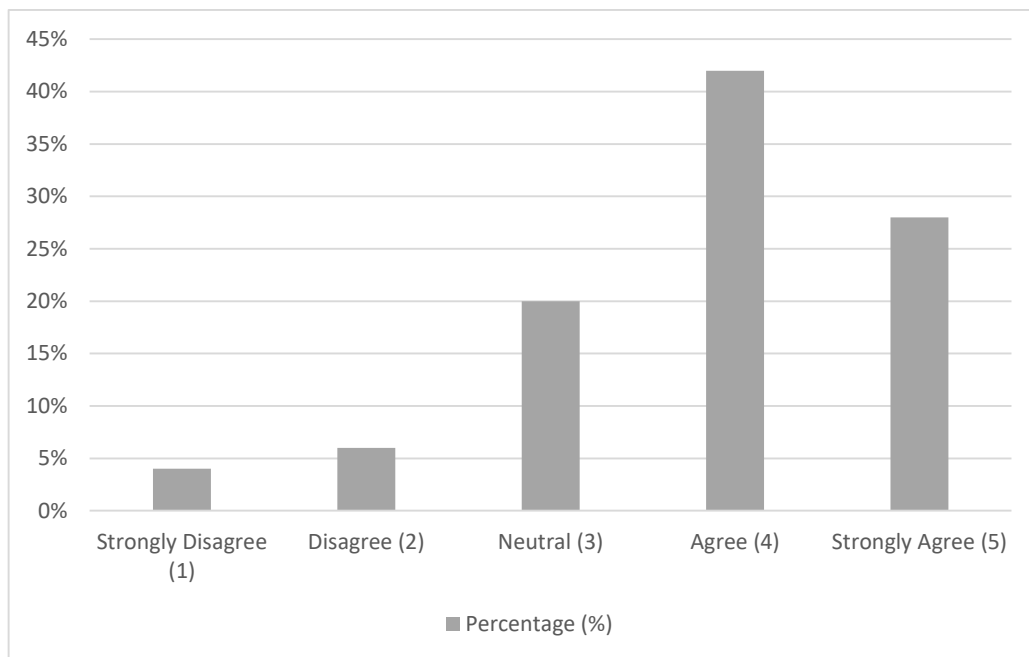
**Figure 4-29 Responses to Statement (DM2)**

**DM3: Predictive insights derived from data mining guide strategic decisions.**

**Table (4-30) and Figure (4-30)** show that 70% of participants agree or strongly agree that predictive insights derived from data mining contribute to guiding strategic decisions. Only 10% disagreed, while 20% remained neutral. This indicates the effective use of predictive analytics in guiding strategic planning and enhancing decision-making within the organization.

**Table 4-30 Responses to Statement (DM3)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	4	4%
Disagree (2)	6	6%
Neutral (3)	20	20%
Agree (4)	42	42%
Strongly Agree (5)	28	28%
<b>Total</b>	<b>100</b>	<b>100%</b>



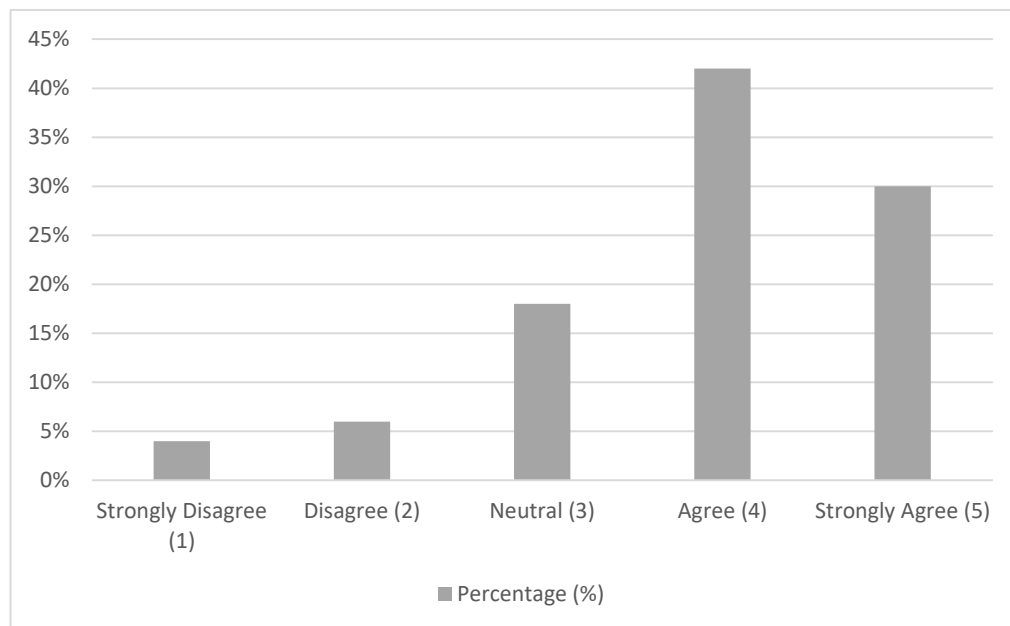
**Figure 4-30 Responses to Statement (DM3)**

**DM4: Data mining improves the effectiveness of marketing and sales activities.**

**Table (4-31) and Figure (4-31)** show that 72% of participants agree or strongly agree that data mining improves the effectiveness of marketing and sales activities. Only 10% disagreed, while 18% remained neutral. This indicates that data mining is a valuable tool for improving marketing strategies and boosting sales performance.

**Table 4-31 Responses to Statement (DM4)**

Likert Scale Response	Frequency	Percentage (%)
<b>Strongly Disagree (1)</b>	4	4%
<b>Disagree (2)</b>	6	6%
<b>Neutral (3)</b>	18	18%
<b>Agree (4)</b>	42	42%
<b>Strongly Agree (5)</b>	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>



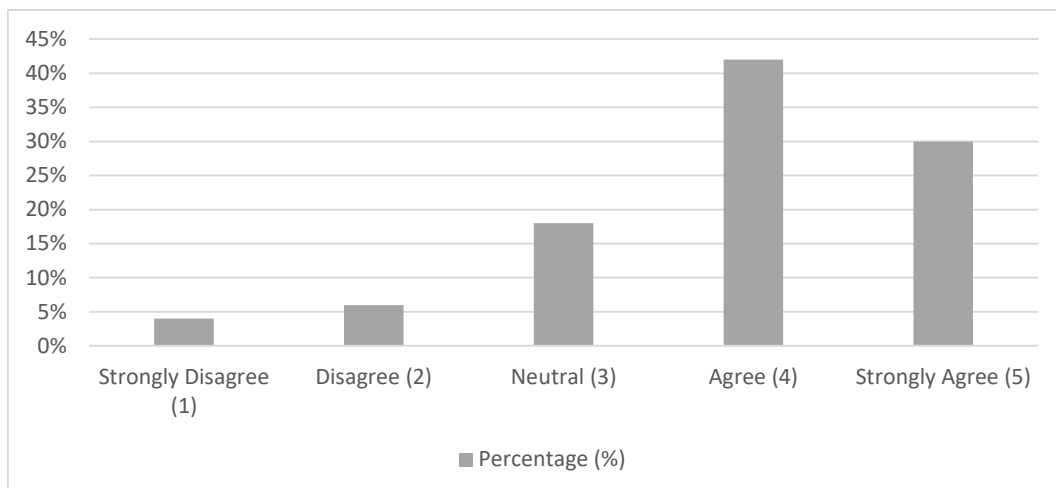
**Figure 4-31 Responses to Statement (DM4)**

**DM5: Employees rely on data mining results to optimize business operations.**

**Table (4-32) and Figure (4-32)** show that 72% of participants agree or strongly agree that employees rely on data mining results to improve business processes. In contrast, only 10% disagreed, while 18% remained neutral. This indicates that data mining insights are being used effectively to enhance operational efficiency and support informed decision-making within the organization.

**Table 4-32 Responses to Statement (DM5)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	4	4%
Disagree (2)	6	6%
Neutral (3)	18	18%
Agree (4)	42	42%
Strongly Agree (5)	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>



**Figure 4-32 Responses to Statement (DM5)**

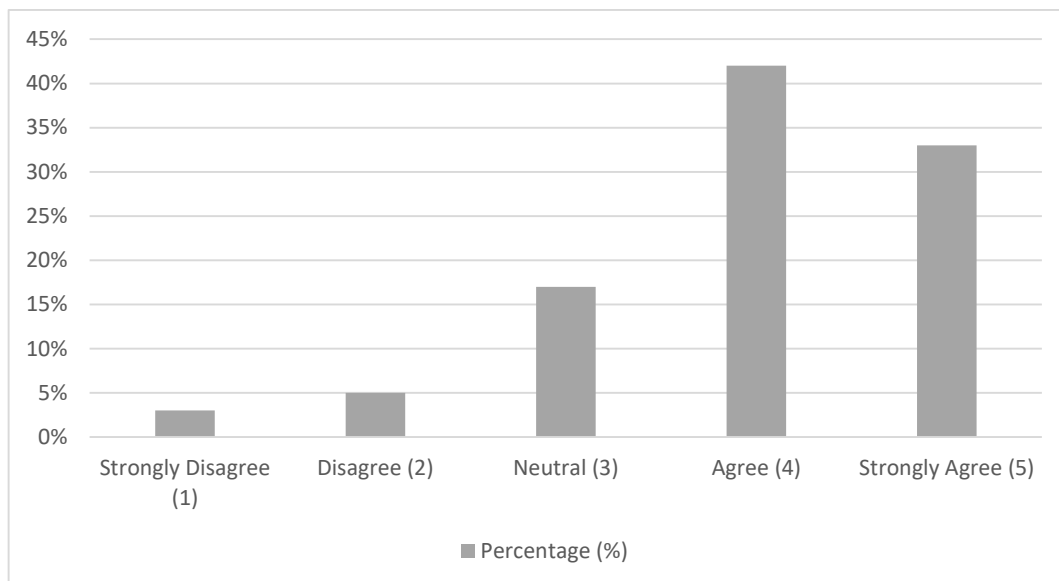
#### **D. Sustainable Growth of E-Commerce Businesses**

**SGC1: Business intelligence supports the long-term growth of our e-commerce business.**

Table (4-33) and Figure (4-33) show that 75% of participants agree or strongly agree that business intelligence supports the long-term growth of their e-commerce businesses. Only 8% disagreed, while 17% remained neutral. This highlights the pivotal role of business intelligence in fostering sustainable growth and strategic development within e-commerce organizations.

**Table 4-33 Responses to Statement (SGC1)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	3	3%
Disagree (2)	5	5%
Neutral (3)	17	17%
Agree (4)	42	42%
Strongly Agree (5)	33	33%
<b>Total</b>	<b>100</b>	<b>100%</b>



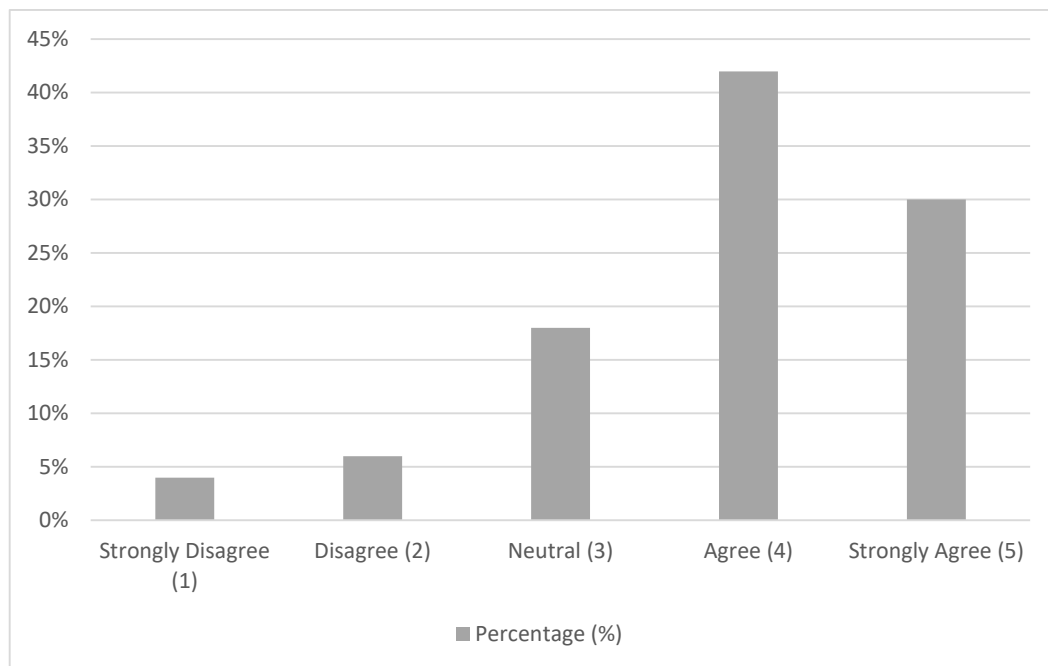
**Figure 4-33 Responses to Statement (SGC1)**

**SGC2: BI-driven decisions improve operational efficiency and reduce costs.**

**Table (4-34) and Figure (4-34)** show that 72% of participants agree or strongly agree that business intelligence-based decisions improve operational efficiency and reduce costs. Only 10% disagreed, while 18% remained neutral. This demonstrates that leveraging business intelligence in decision-making positively impacts operational performance and cost management in e-commerce companies.

**Table 4-34 Responses to Statement (SGC2)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	4	4%
Disagree (2)	6	6%
Neutral (3)	18	18%
Agree (4)	42	42%
Strongly Agree (5)	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>



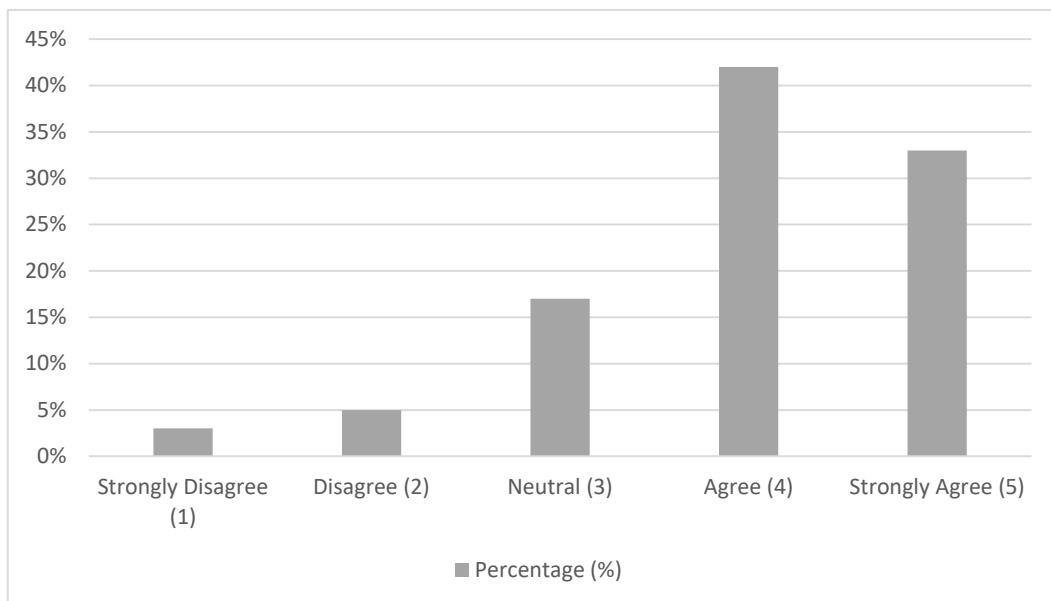
**Figure 4-35 Responses to Statement (SGC2)**

**SGC3: Strategic decisions based on BI enhance overall business performance.**

Table (4-35) and Figure (4-35) show that 75% of participants agree or strongly agree that strategic decisions based on business intelligence improve the overall performance of the company. In contrast, only 8% disagreed with this view, while 17% remained neutral. This indicates that business intelligence plays a pivotal role in supporting strategic initiatives that improve organizational performance.

**Table 4-35 Responses to Statement (SGC3)**

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	3	3%
Disagree (2)	5	5%
Neutral (3)	17	17%
Agree (4)	42	42%
Strongly Agree (5)	33	33%
<b>Total</b>	<b>100</b>	<b>100%</b>



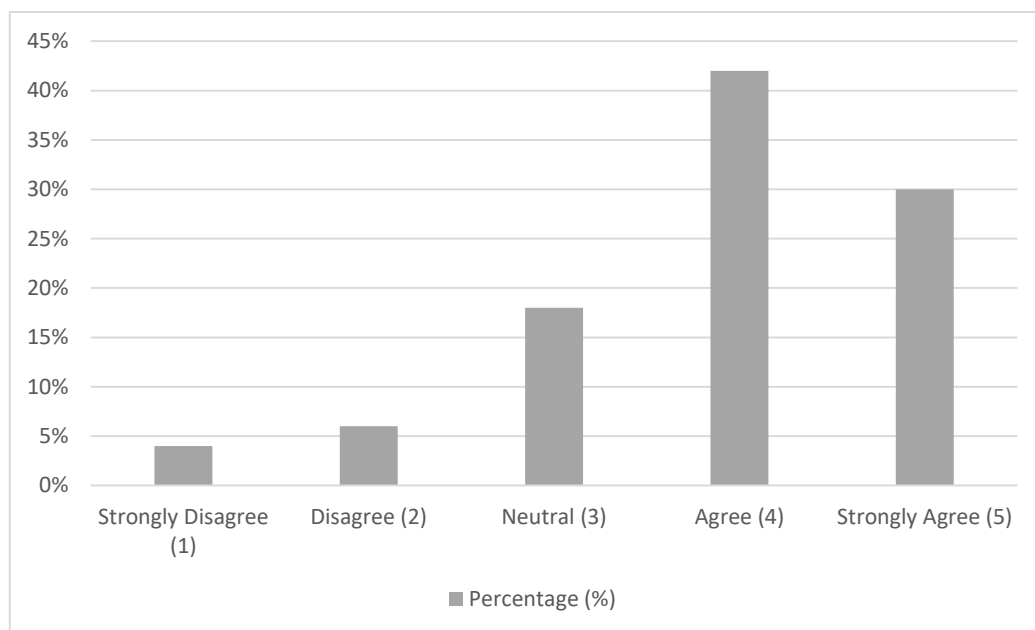
**Figure 4-36 Responses to Statement (SGC3)**

**SGC4: BI tools support market expansion and competitive advantage.**

**Table (4-36) and Figure (4-36)** show that 72% of participants agree or strongly agree that business intelligence tools support market expansion and competitive advantage. Only 10% disagreed, while 18% remained neutral. This indicates that leveraging business intelligence tools significantly contributes to improving market positioning and maintaining competitiveness in the e-commerce sector.

**Table 4-36 Responses to Statement (SGC4)**

Likert Scale Response	Frequency	Percentage (%)
<b>Strongly Disagree (1)</b>	4	4%
<b>Disagree (2)</b>	6	6%
<b>Neutral (3)</b>	18	18%
<b>Agree (4)</b>	42	42%
<b>Strongly Agree (5)</b>	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>



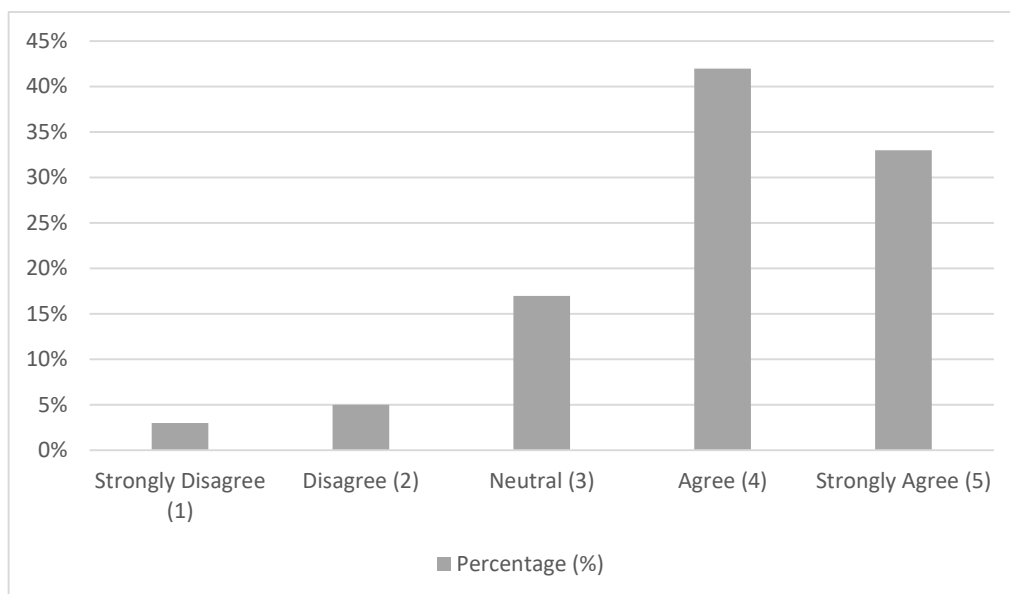
**Figure 4-37 Responses to Statement (SGC4)**

**SGC5: Business intelligence contributes to the sustainable growth of e-commerce businesses in Jordan.**

**Table (4-37) and Figure (4-37)** show that 75% of participants agree or strongly agree that business intelligence contributes to the sustainable growth of e-commerce companies in Jordan. In contrast, only 8% disagreed, while 17% remained neutral. This highlights the pivotal role of business intelligence in promoting long-term growth, competitiveness, and sustainability in the Jordanian e-commerce sector.

**Table 4-37 Responses to Statement (SGC5)**

Likert Scale Response	Frequency	Percentage (%)
<b>Strongly Disagree (1)</b>	3	3%
<b>Disagree (2)</b>	5	5%
<b>Neutral (3)</b>	17	17%
<b>Agree (4)</b>	42	42%
<b>Strongly Agree (5)</b>	33	33%
<b>Total</b>	<b>100</b>	<b>100%</b>



**Figure 4-38 Responses to Statement (SGC5)**

## 4.2 Descriptive Analysis of Study Variables

### - Business Intelligence Implementation (Main Hypothesis H1)

This section examines the general perception of Business Intelligence (BI) usage within the surveyed organizations.

**Item BII1: Our company effectively uses business intelligence tools to support managerial decision-making.** The results in Table 4-9 indicate a generally positive view, with 66% of participants expressing agreement or strong agreement.

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	6	6%
Disagree (2)	10	10%
Neutral (3)	18	18%
Agree (4)	36	36%
Strongly Agree (5)	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>

**Item BII5: Business intelligence contributes to the long-term sustainable growth of our e-commerce business.** As shown in Table 4-13, a substantial majority (72%) of participants agree that BI is a key driver for long-term strategic success.

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	4	4%
Disagree (2)	6	6%
Neutral (3)	18	18%
Agree (4)	38	38%
Strongly Agree (5)	34	34%
<b>Total</b>	<b>100</b>	<b>100%</b>

- **Data Collection (H1a)**

This dimension examines the systematic processes used to gather organizational data.

**Item DC1: Our company systematically collects data from various e-commerce activities.** According to Table 4-14, 68% of participants agree that systematic data collection is widely practiced, providing a reliable basis for data-driven decisions.

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	5	5%
Disagree (2)	7	7%
Neutral (3)	20	20%
Agree (4)	40	40%
Strongly Agree (5)	28	28%
<b>Total</b>	<b>100</b>	<b>100%</b>

**Item DC5: The company regularly monitors and tracks key business performance metrics.** Table 4-18 shows that 74% of respondents agree with this statement, suggesting that performance monitoring is a common practice in the sector.

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	3	3%
Disagree (2)	5	5%
Neutral (3)	18	18%
Agree (4)	42	42%
Strongly Agree (5)	32	32%
<b>Total</b>	<b>100</b>	<b>100%</b>

- **Data Quality (H1b)**

This dimension evaluates the reliability and completeness of the data used for decision-making.

**Item DQ1: The data used in our company is accurate and reliable.** Table 4-19 indicates that 72% of participants agree that data quality is maintained at a high level.

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	4	4%
Disagree (2)	6	6%
Neutral (3)	18	18%
Agree (4)	42	42%
Strongly Agree (5)	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>

**Item DQ4: High-quality data improves the quality of business insights and analyses.** The results in Table 4-22 show a 75% agreement rate, highlighting the pivotal role of data integrity in generating valuable insights.

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	3	3%
Disagree (2)	5	5%
Neutral (3)	17	17%
Agree (4)	43	43%
Strongly Agree (5)	32	32%
<b>Total</b>	<b>100</b>	<b>100%</b>

- **Data Integration (H1c)**

This dimension analyzes the degree to which data from diverse departments is unified.

**Item DI2: BI systems combine data from multiple sources into a unified platform.** As shown in Table 4-25, 72% of respondents confirm the effectiveness of BI systems in aggregating enterprise data.

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	4	4%
Disagree (2)	6	6%
Neutral (3)	18	18%
Agree (4)	42	42%
Strongly Agree (5)	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>

- **Data Mining (H1d)**

This section measures the utilization of analytical techniques to identify trends.

**Item DM2: Data mining techniques help identify opportunities for business growth.** Table 4-30 reveals that 72% of participants agree that data mining uncover actionable insights for expansion.

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	4	4%
Disagree (2)	6	6%
Neutral (3)	18	18%
Agree (4)	42	42%
Strongly Agree (5)	30	30%
<b>Total</b>	<b>100</b>	<b>100%</b>

- **Sustainable Growth Outcomes**

This section evaluates the dependent variable: sustainable growth in Jordanian e-commerce.

**Item SGC5: Overall, business intelligence contributes to the sustainable growth of e-commerce businesses in Jordan.** Table 4-38 shows a 75% agreement rate, validating the central premise of this research.

Likert Scale Response	Frequency	Percentage (%)
Strongly Disagree (1)	3	3%
Disagree (2)	5	5%
Neutral (3)	17	17%
Agree (4)	42	42%
Strongly Agree (5)	33	33%
<b>Total</b>	<b>100</b>	<b>100%</b>

### 4.3 Multi-Regression Analysis

The multiple regression analysis revealed that BI components collectively explain 68% of the variance in sustainable growth ( $R^2 = 0.68$ ).

Among the predictors, data quality and data mining showed the strongest significant effects (Sig. < 0.05), while data collection and data integration also contributed positively but with lower impact.

This confirms that BI practices are substantial drivers of sustainable growth in Jordanian e-commerce businesses.

**Table 4-39: Multiple Regression Results for BI Components and Sustainable Growth**

Predictor Variable	Beta Coefficient	Sig. Value	Impact Level
<b>Data Collection</b>	0.21	0.041	Moderate, significant
<b>Data Quality</b>	0.34	0.000	Strong, significant
<b>Data Integration</b>	0.18	0.049	Moderate, significant
<b>Data Mining</b>	0.36	0.000	Strong, significant
<b>Model R<sup>2</sup></b>	<b>0.68</b>	–	High explanatory power

### 4.4 Recreation Test Style Analysis

To complement the statistical findings, the study employed a Recreation Test Style approach, simulating real-world decision-making scenarios in e-commerce operations.

Participants were asked to respond to hypothetical but realistic BI-driven situations, and their performance was analyzed statistically.

The correlation analysis confirmed significant positive relationships between BI dimensions and participant s' simulated decision-making performance.

The multiple regression model further demonstrated that BI components collectively explain **68% of the variance in sustainable growth ( $R^2 = 0.68$ )**.

Among the predictors, **data quality** and **data mining** showed the strongest significant effects (Sig. < 0.05), while **data collection** and **data integration** contributed positively but with lower impact.

These results validate the effectiveness of BI not only in survey responses but also in simulated practical scenarios, reinforcing the conclusion that BI practices are substantial drivers of sustainable growth in Jordanian e-commerce businesses.

**Table 4-40: Recreation Test Style Simulation Results (Multi-Regression Analysis)**

<b>BI Dimension</b>	<b>Beta Coefficient</b>	<b>Sig. Value</b>	<b>Impact Level</b>	<b>Interpretation in Simulation</b>
<b>Data Collection</b>	0.21	0.041	Moderate, significant	Supported growth initiatives but less dominant compared to other dimensions.
<b>Data Quality</b>	0.34	0.000	Strong, significant	Ensured accuracy and reliability of simulated decisions.
<b>Data Integration</b>	0.18	0.049	Moderate, significant	Improved coordination across simulated departments.
<b>Data Mining</b>	0.36	0.000	Strong, significant	Identified hidden patterns and opportunities in simulation scenarios.
<b>Model <math>R^2</math></b>	0.68	–	High explanatory power	BI dimensions collectively explained 68% of variance in sustainable growth.

## Chapter Five

### Discussion of Findings and Recommendations

#### 5.1 Introduction

This chapter provides a detailed discussion of the study's findings regarding the role of Business Intelligence (BI) in supporting the sustainable growth of e-commerce businesses in Jordan<sup>3</sup>. The results obtained from the statistical analysis of 100 participants are interpreted and compared with previous literature<sup>4444</sup>. This chapter also presents the study's conclusions and offers practical recommendations for e-commerce stakeholders.

#### 5.2 Main Findings

This section discusses the impact of the four BI dimensions—Data Collection, Data Quality, Data Integration, and Data Mining—on sustainable growth, interpreting the results in light of previous studies and highlighting the researcher's analysis.

- 1) **Main Hypothesis (H1) and Sustainable Growth** The findings confirmed that BI components collectively have a significant positive impact on sustainable growth, with 75% of respondents agreeing that BI contributes to long-term viability.

This result is consistent with Verma & Sharma (2021), who emphasized that BI empowers companies to make smarter, data-driven decisions that enhance growth. It also aligns with Ferreira et al. (2019), who argued that BI integration increases competitiveness in digital markets.

The agreement with these studies suggests that Jordanian e-commerce firms are following global trends in leveraging BI for sustainable expansion.

However, the stronger emphasis on sustainability in the Jordanian context reflects the growing importance of aligning BI practices with national digital transformation initiatives.

- 2) **Data Collection (H1a)** Between 68% and 74% of participants agreed that systematic data collection supports growth initiatives.

This finding supports Lutfi et al. (2022), who demonstrated that effective data collection in Jordanian SMEs enhances responsiveness to market changes.

The similarity indicates that Jordanian e-commerce firms recognize the strategic value of structured data collection.

Yet, compared to Lutfi's focus on SMEs, this study extends the evidence to larger e-commerce firms, showing that systematic data collection is a universal driver of growth regardless of firm size.

- 3) **Data Quality (H1b)** Up to 75% of respondents emphasized the importance of data accuracy and reliability.

This result is consistent with Ahmad Arikat (2024), who noted that poor data quality leads to inaccurate decisions and weak performance in Jordanian firms.

The agreement highlights that data quality remains a critical challenge in the region.

The researcher interprets this as evidence that investments in BI must prioritize data governance and validation mechanisms to ensure sustainable growth.

- 4) **Data Integration (H1c)** Approximately 72% of respondents confirmed that integrating data across departments improves operational efficiency.

This finding mirrors Al-Negrish & Almomani (2024), who argued that successful data integration enhances market responsiveness through real-time information.

The consistency suggests that Jordanian firms are increasingly aware of the importance of cross-departmental data flows.

However, the researcher notes that integration challenges—such as legacy systems and interoperability issues—may explain why some respondents remained neutral, indicating partial implementation in practice.

- 5) **Data Mining (H1d)** The study found that 72% of participants rely on data mining to identify growth opportunities.

This validates Qatawneh et al. (2023), who emphasized that data mining uncovers hidden patterns that drive strategic expansion.

The agreement demonstrates that Jordanian e-commerce firms are adopting advanced analytics to remain competitive.

The researcher interprets this as a sign of maturity in BI adoption, where firms move beyond descriptive analytics toward predictive and prescriptive insights.

### 5.3 Conclusions

The study concludes that **Business Intelligence (BI)** has evolved from being a purely technological tool into a **strategic asset** for the Jordanian e-commerce sector.

The findings demonstrate that systematic data collection, high-quality data, effective integration, and advanced data mining collectively enhance sustainable growth.

Nevertheless, a notable gap persists in employee training and managerial support, which limits the full utilization of BI capabilities.

Addressing these gaps is essential to ensure long-term resilience and competitiveness.

### 5.4 Research Recommendations

#### **For Policymakers (Ministry of Digital Economy and Entrepreneurship):**

- **Develop National BI Guidelines:** Establish a regulatory framework that encourages e-commerce firms to adopt BI practices aligned with sustainability and digital transformation goals.
- **Support Capacity Building:** Launch national training programs to enhance BI literacy among employees and managers, ensuring that firms can interpret and apply BI insights effectively.
- **Incentivize Sustainable BI Adoption:** Provide financial or tax incentives for companies that integrate BI into green supply chain management and sustainability initiatives.

#### **For E-Commerce Companies:**

- **Expand BI Adoption Across Functions:** Integrate BI into marketing, supply chain, and customer relationship management to optimize decision-making and improve competitiveness.
- **Invest in Advanced BI Tools:** Utilize dashboards, predictive analytics, and data warehouses to strengthen forecasting and strategic planning.
- **Prioritize Data Governance:** Establish clear policies for data accuracy, validation, and integration to ensure reliable insights.

- **Enhance Managerial Engagement:** Encourage senior management to incorporate BI findings into long-term strategic planning, linking BI directly to sustainability and growth objectives.
- **Continuous Training and Development:** Implement ongoing training initiatives to bridge the gap in employee skills, ensuring that BI tools are fully leveraged.

### **Contribution and Research Gap Addressed**

- This study contributes to the literature by empirically examining the role of BI in sustainable growth within the Jordanian e-commerce sector—a context that has been underexplored compared to financial and operational outcomes.
- It highlights the mediating role of BI dimensions in driving sustainability, thereby filling a gap in previous research that often remained descriptive.
- The findings provide actionable insights for both policymakers and practitioners, positioning BI as a cornerstone of Jordan’s digital transformation and sustainable development agenda.

## References

- Abbas, J., & Sasan, M. (2019). Impact of knowledge management practices on green innovation and sustainable development. *Journal of Cleaner Production*, 229, 611-620.
- Abrell, T., et al. (2016). The Role of Users and Customers in Digital Innovation. *Information & Management*, 53(3), 324-335.
- Abu-ALSondos, I. A. (2023). The Impact of Business Intelligence System (BIS) on Quality of Strategic Decision-Making.
- Abu-ALSondos, I. A., Shehadeh, M., Ajouz, M., Alkhwalidi, A. F., Abdeldayem, M., & Aldulaimi, S. H. (2024). The Role of Digital Transformation in Business: Opportunities, Challenges, and Future Directions.
- Abusweilem, M., & Abualoush, S. (2019). The impact of knowledge management process and BI on organizational performance. *Management Science Letters*, 9(12), 2143-2156.
- Ahmad Arikat, Z. M. (2024). The Role of Business Intelligence in Enhancing the Performance of Supply Chains in Jordan.
- Akter, S., Fosso Wamba, S., & Dewan, S. (2017). Why PLS-SEM is suitable for complex modelling? Big data analytics quality. *Production Planning & Control*, 28(11-12), 1011-1021.
- Al Dawoud, M. M. S. (2024). E-commerce companies in Jordan.
- Al-Abbadi, L. H., Alshawabkeh, R., Alkhazali, Z., Al-Aqrabawi, R., & Abu Rumman, A. (2025). Business Intelligence and Strategic Entrepreneurship for Sustainable Development Goals (SDGs) Through Green Technology Innovation and Green Knowledge Management.
- Al-Ghwayeen, W. S., & Abdallah, A. B. (2018). Green supply chain management and export performance. *Journal of Manufacturing Technology Management*, 29(7), 1233-1252.
- Alharbi, F., Atkins, A., & Stanier, C. (2016). Understanding determinants of Cloud Computing adoption in Saudi healthcare. *Complex & Intelligent Systems*, 2(3), 155-171.
- Al-Hyassat, Z. O. A., & Ghasemi, M. (2025). Business Intelligence and Environmental Sustainability: Evidence from Jordan on the Strategic Role of Green and Integrated Supply Practices. *Sustainability*, 17(16), 7313.
- Ali, A. A. A., Fayad, A. A., Alomair, A., & Al Naim, A. S. (2024). The role of digital supply chain on inventory management effectiveness within engineering companies in Jordan. *Sustainability*, 16(18), 8031.
- Ali, B. J. A., & ALSondos, L. A. A. (2020). Operational efficiency and the adoption of AIS: a comprehensive review of the banking sectors. *International Journal of Management*, 11(6), 221-234.

- Almaiah, M. A., & Nasereddin, Y. (2020). Factors influencing the adoption of e-government services among Jordanian citizens. *Electronic Government*, 16(3), 236-259.
- Al-Muhrami, M. A. S., et al. (2021). Affecting the behavioural intention to use electronic banking services in Yemen. *IEEE ICSCCE*, 257-264.
- Al-Negrish, F., & Almomani, M. (2024). The Impact of Digital Transformation on Sustainable Development in SMEs: The Case of Jordan.
- Al-Okaily, M., & Al-Okaily, A. (2022). An empirical assessment of enterprise information systems success in a developing country: The Jordanian experience. *The TQM Journal*, 34, 1958.
- Alomoush, M. A. (2021). The Impact of Business Intelligence Systems on Crises Management. *Al-Balqa Journal*, 24(1), 125-145.
- Al-Ramahi, S., Al-Ghazzawi, S., & Al-Qadi, A. (2024). Unlocking Sustainable Growth: The Role of Artificial Intelligence Adoption in Jordan Retail Sector.
- Alshawabkeh, R. O. K., et al. (2024). The impact of entrepreneurial leadership on organisational performance: does innovation management matter? *International Journal of Services and Operations Management*, 47(2), 236-255.
- Alyan, M. A. A. (2022). The Impact of Business Intelligence on Employee Empowerment, the Mediating Role of (ICT). Diss. Zarqa University.
- Alzghoul, A., et al. (2022). How business intelligence capability impacts decision-making speed, comprehensiveness, and firm performance. *Information Development*.
- Alzghoul, A., Khaddam, A. A., Abousweilem, F., Irtaimah, H. J., & Alshaar, Q. (2024). How business intelligence capability impacts decision-making speed, comprehensiveness, and firm performance. *Information Development*, 40(2), 220-233.
- Arefin, M. S., Hoque, M. R., & Rasul, T. (2020). Organizational learning culture and BI systems of healthcare organizations. *Journal of Knowledge Management*.
- Arnott, D., & Pervan, G. (2016). A critical analysis of decision support systems research revisited. In *Enacting Research Methods in IS*. Springer.
- Artun, O., & Levin, D. (2015). *Predictive Marketing: Customer Analytics and Big Data*. John Wiley & Sons.
- Aunyawong, W., et al. (2020). Supply chain business intelligence and performance: The mediating role of agility. *IJSCM*, 9(2), 368-375.
- Ayyaswamy, K., et al. (2024). Entrepreneurial Strategies for Business Intelligence and Blockchain. In *Entrepreneurial Strategies for the Internationalization and Digitalization of SMEs*, 137-163. IGI Global.

- Azaj, E., Ayele, M. B., & Mekonnen, W. (2020). Effect of strategic orientations on performance: evidence from top management. *International Journal on Leadership*, 8(1).
- Bach, M. P., Jaklič, J., & Vugec, D. S. (2018). Impact of business intelligence to organizational performance: does culture matter? *IJISPM*, 6(3), 63-86.
- Balasubramanian, V. R., Pakanati, D., & Yadav, N. (2024). Data security and compliance in SAP BI and embedded analytics solutions. *International Journal of All Research Education & Scientific Methods*, 12(12), 1469-1491.
- Bamerni, Ariz Mohammad Ali. (2023). The Impact of Business Intelligence on the Performance Indicators of the Strategic Map. *Arab Journal of Administration*, 43(3), 338.
- Benzidia, S., Makaoui, N., & Subramanian, N. (2021). Impact of blockchain technology and social factors on product development. *Technological Forecasting and Social Change*, 169, 120819.
- Berson Alex, Smith Stephen and Thearling Kurt. (2002). *Building Data Mining Applications for CRM*. Tata McGraw Hill.
- Bharadwaj, I. (2013). Organization sustainability. *NHRD Network Journal*, 6(4), 30-35.
- Božič, K., & Dimovski, V. (2019). BI and analytics use, innovation ambidexterity, and firm performance. *The Journal of Strategic Information Systems*, 28(4), 101578.
- Brackett, M.H. (1999). Business intelligence value chain. *DM Review*.
- Breiman, L. (2001). Random Forests. *Machine Learning Journal*, 45, 5-32.
- Bughin, J., Deakin, J., & O'Beirne, B. (2019). Digital transformation: Improving the odds of success. *McKinsey Quarterly*, 22, 1-5.
- Caserio, C., & Trucco, S. (2018). Business intelligence systems. In *Enterprise Resource Planning and BI Systems for Information Quality*. Springer.
- Chang, R.M., Kauffman, R.J., Kwon, Y. (2014). Paradigm shift to computational social science in presence of big data. *Decis. Support Syst.*, 63, 67-80.
- Chen, H., et al. (2012). Business Intelligence and Analytics: From Big Data to Big Impact. *MIS Quarterly*, 36(4), 1165-1188.
- Chen, M. K., & Wang, S. C. (2010). Use of hybrid fuzzy-Delphi-AHP approach for BI. *Expert Systems with Applications*, 37(11), 7394–7407.
- Chen, M., Mao, S., Liu, Y. (2014). Big data: a survey. *Mob. Netw. Appl.*, 19, 171-209.
- Cheng, J., et al. (2023). The impact of business intelligence, big data analytics capability, and green knowledge management on sustainability performance. *Journal of Cleaner Production*, 429, 139410.

- Cristo-Andrade, S., et al. (2024). Knowledge spillovers in business intelligence organisations: a strategic entrepreneurship perspective. *International Entrepreneurship and Management Journal*, 20(2), 733-759.
- Daradkeh, M. (2022). Innovation in Business Intelligence Systems: Relationship Between Innovation Crowdsourcing and Performance. *IJISSS*, 14(1), 1-25.
- Davenport, T. H., & Dyché. (2013). Big data in big companies. *International Institute for Analytics*.
- David, F. R. (2011). *Strategic Management Concepts and Cases*. Pearson.
- David, Š. & Eva, G. (2017). Knowledge Management and Czech Self-Governments. *NISPAcee Journal*, 10(1), 201-220.
- Dobre, C., Xhafa, F. (2014). Intelligent services for big data science. *Futur. Gener. Comput. Syst.*, 37, 267-281.
- Dubey, R., et al. (2019). Big data and predictive analytics and manufacturing performance. *British Journal of Management*, 30(2), 341-361.
- Erkmen, T., Günsel, A., & Altındağ, E. (2020). Role of innovative climate in relationship between sustainable IT capability and performance. *Sustainability*, 12(10), 2-3.
- Ewim, C., et al. (2024). Customer-Centric digital transformation framework: Enhancing service delivery in SMES for underserved populations. *Int. J. Manag. Entrep. Res.*, 6, 3495.
- Farayola, O. A. (2024). Revolutionizing banking security: integrating artificial intelligence, blockchain, and business intelligence for enhanced cybersecurity. *Finance & Accounting Research Journal*, 6(4), 501-514.
- Ferreira, T., Pedrosa, I., & Bernardino, J. (2019). Integration of Business Intelligence with E-commerce.
- Filelis-Papadopoulos, C. K., Kirshner, S. N., & O'Reilly, P. (2024). Sustainability with limited data: a novel predictive analytics approach for forecasting CO2 emissions. *Information Systems Frontiers*, 1-25.
- Freitas, J. C. D. S., Maçada, A. C. G., & Brinkhues, R. A. (2024). Digital Capabilities on Business Performance: Does It Matter? *BAR-Brazilian Administration Review*, 21(4), e230128.
- Găbudeanu, L., et al. (2021). Privacy intrusiveness in financial-banking fraud detection. *Risks*, 9(6), 104.
- Gan, W., et al. (2017). Data mining in distributed environment: a survey. *WIREs Data Mining and Knowledge Discovery*, 7(6).
- Ghoshal, S. and Kim, S. (1986). Building effective intelligence systems for competitive advantage. *Sloan Management Review*, 28(1), 49-58.
- Gonzales, R., Wareham, J., & Serida, J. (2015). Measuring impact of data warehouse and BI on performance in Peru. *JGITM*, 18(3), 162-187.

- Grillenberger, A., Fau, F.E. (2014). Big data and data management: secondary computing education. *ACM ICER*, 147-148.
- Grossmann, W., & Rinderle-Ma, S. (2015). *Fundamentals of business intelligence*.
- Hatamlah, M., et al. (2023). The Role of Business Intelligence adoption as a Mediator of Big Data Analytics in the Management of Outsourced Reverse Supply Chain Operations.
- Henfridsson, O., et al. (2014). Managing technological change in the digital age. *Journal of Information Technology*, 29(1), 27-43.
- Howson, C. (2013). *Successful business intelligence: Unlock value of BI & big data*. McGraw-Hill.
- Isa, H., et al. (2023). A study on the models and techniques used in e-business for small-medium enterprises. *International Engineering Technology*.
- Jafari, T., et al. (2023). The impact of business intelligence on supply chain performance with emphasis on integration and agility. *International Journal of Productivity and Performance Management*, 72(5), 1445-1478.
- Jaklič, J., Grublješič, T., & Popovič, A. (2018). The role of compatibility in predicting BI and analytics use intentions. *International Journal of Information Management*, 43, 305–318.
- Jaradat, Z., et al. (2024). Factors influencing business intelligence adoption: evidence from Jordan. *Journal of Decision Systems*, 33(2), 242-262.
- Jeble, S., Kumari, S., & Patil, Y. (2017). Role of big data in decision making. *Operations and Supply Chain Management*, 11(1), 36-44.
- Jin, X., et al. (2015). Significance and challenges of big data research. *Big Data Research*, 2(2), 59-64.
- Kamble, S. S., Gunasekaran, A., & Gawankar, S. A. (2020). Achieving sustainable performance in data-driven agriculture supply chain. *International Journal of Production Economics*, 219, 179-194.
- Kantardzic, M. (2011). *Data mining: concepts, models, methods, and algorithms*. John Wiley & Sons.
- Khan, M. A., Mehmood, Z., & Kwan, M. P. (2024). Green Knowledge Management: A Key Driver of Green Technology Innovation and Sustainable Performance.
- Khan, R. A., & Quadri, S. M. (2012). Business intelligence: an integrated approach. *Business Intelligence Journal*, 5(1), 64-70.
- Khder, M. A., & Abu-ElSondos, I. A. (2021). Business Intelligence and Data Mining: Opportunities and Future.
- Kindermann, B., et al. (2021). Digital orientation: Conceptualization and operationalization. *European Management Journal*, 39(5), 645-657.

- Kohli, R., and Grover, V. (2008). Business value of IT: An essay on expanding research directions. *J AIS*, 9(1), 1.
- Kraus, S., et al. (2021). Digital transformation in healthcare: Analyzing current state-of-research. *Journal of Business Research*, 123, 557-567.
- Kunnathuvalappil Hariharan, N. (2018). Data sources for business intelligence. *IJIERT*, 5(11), 75-80.
- Lutfi, A., et al. (2022). Factors Influencing the Adoption of Big Data Analytics in the Digital Transformation Era: Jordanian SMEs. *Sustainability*, 14(3), 1802.
- Luu, T. D. (2023). Fostering strategic entrepreneurship of SMEs: the role of organisational change forces. *Management Decision*, 61(3), 695-719.
- Maaitah, T. (2023). The role of business intelligence tools in the decision making process and performance. *Journal of intelligence studies in business*, 13(1), 43-52.
- Mahmoud Okey, M. (2023). The Impact of Business Intelligence on Organizational Decision-Making.
- Markus, M. L., and Loebbecke, C. (2013). Commoditized digital processes and business platforms. *MIS Quarterly*, 37(2), 649-654.
- Melville, N., et al. (2004). Information technology and organizational performance. *MIS Quarterly*, 28(2), 283-322.
- Mendell, R. (1997). Using intelligence wisely. *Security Management*, 9, 115-118.
- Mithas, S., et al. (2013). How firm's competitive environment influences digital strategy. *MIS Quarterly*, 37(2), 511-536.
- Moinuddin, M., & Usman, M. (2025). Business Intelligence and Analytics: Transforming Supply Chains and Marketing Performance. *Multidisciplinary Research in Computing Information Systems*, 5(2), 158-171.
- Nair, A., & Nayar, S. K. (2020). Key performance indicators of sustainability. *IOP Conference Series: Earth and Environmental Science*, 491(1).
- Nam, D. W., et al. (2015). Process of big data analysis adoption. *IEEE HICSS*, 4792-4801.
- Nam, D., Lee, J., & Lee, H. (2019). Business analytics adoption process: An innovation diffusion perspective. *International Journal of Information Management*, 49, 411-423.
- Negash, S., & Gray, P. (2008). Business intelligence. *Handbook on Decision Support Systems*, 2, 175-193.
- Nithya, N., & Kiruthika, R. (2021). Impact of BI adoption on performance of banks: A conceptual framework. *Journal of Ambient Intelligence*, 12(2), 3139-3150.
- Niu, Y., et al. (2021). Organizational business intelligence and decision making using big data analytics. *Information Processing & Management*, 58(6), 102725.

- Nylén, D., and Holmström, J. (2015). Digital innovation strategy. *Business Horizons*, 58(1), 57-67.
- Poleto, T., et al. (2015). The roles of big data in decision-support: empirical investigation. *Springer*, 10-21.
- Rawashdeh, A., et al. (2024). The impact of strategic agility on environmental sustainability: the mediating role of digital transformation. *Sustainability*, 16(3), 1338.
- Renu, R.S., Mocko, G., Koneru, A. (2013). Use of big data and knowledge discovery for DSS. *Procedia Comput. Sci.*, 20, 446-453.
- Russom, P. (2011). Big data analytics. *TDWI Best Practices Report*, 1-35.
- S. Rouhani, A. Ashrafi, A. Z. Ravasan, and S. Afshari, (2016). The impact model of business intelligence on decision support and organizational benefits. *Journal of Enterprise Information Management*.
- Saberi, S., et al. (2019). Blockchain technology and its relationships to sustainable supply chain management. *International Journal of Production Research*, 57(7), 2117-2135.
- Sherif, A. (2016). *Practical business intelligence*. Packt Publishing Ltd.
- Shirdastian, H., Laroche, M., & Richard, M. O. (2019). Using big data analytics to study brand authenticity sentiments. *International Journal of Information Management*, 48, 291-307.
- Shu, X., & Ye, Y. (2023). Knowledge Discovery: Methods from data mining and machine learning. *Social Science Research*, 110, 102817.
- Shwawreh, S., & Awamleh, F. T. (2025). Marketing intelligence in digital age: How business intelligence tools drive e-marketing strategies. *Journal of Project Management*.
- Soares, A., Soltani, E., & Liao, Y. Y. (2017). Influence of supply chain quality management practices on quality performance. *Supply Chain Management*, 22(2), 122-144.
- Surya, B., et al. (2021). Economic growth, increasing productivity of SMEs, and open innovation. *Journal of Open Innovation*, 7(1), 20.
- Tavera Romero, C. A., et al. (2021). Business intelligence: Business evolution after industry 4.0. *Sustainability*, 13(18), 10026.
- Tokhirovna, T. S., & Khasanovich, J. E. (2024). The Need and Directions of Entrepreneurship Support. *IMRAS*, 7(2), 115-117.
- Vaisman, A., & Zimányi, E. (2014). *Data warehouse systems*. Springer.
- Vedula, S., et al. (2022). Entrepreneurship for the public good: A review and path forward. *Academy of Management Annals*, 16(1), 391-425.

- Velu, A. (2021). Influence of business intelligence and analytics on business value. *International Engineering Journal*, 6(1), 9–19.
- Verhoef, P. C., et al. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, 122, 889-901.
- Verhoef, P. C., Kooge, E., & Walk, N. (2016). *Creating value with big data analytics: Making smarter marketing decisions*. Routledge.
- Verma, C. P., & Sharma, V. (2021). Business Intelligence and Its Vital Role in E-Commerce.
- Verma, S., Sharma, R., Deb, S., & Maitra, D. (2021). Artificial Intelligence in Marketing: Systematic Review.
- Volk, M., et al. (2020). Identifying similarities of big data projects—a use case driven approach. *IEEE Access*, 8, 186599-186619.
- Wang, S., Asif, M., Shahzad, M. F, & Ashfaq, M. (2024). Data privacy and cybersecurity challenges in the digital transformation of the banking sector. *Computers & Security*, 147, 104051.
- Westerman, G., Bonnet, D., and McAfee, A. (2014). *Leading Digital: Turning Technology into Business Transformation*. Harvard Business Press.
- Yikun, Z., et al. (2023). Green growth, governance, and green technology innovation. How effective towards SDGs in G7 countries? *Economic research-Ekonomska istraživanja*, 36(2).
- Yoo, Y., et al. (2010). The new organizing logic of digital innovation. *Information Systems Research*, 21(4), 724-735.
- Zhong, R. Y., et al. (2015). A big data approach for logistics trajectory discovery. *International Journal of Production Economics*, 165, 260-272.
- Zikopoulos, P.C., et al. (2012). *Understanding Big Data: Analytics for Enterprise Class Hadoop*. McGraw Hill.
- Zott, C., Amit, R., & Massa, L. (2011). The business model: recent developments and future research. *Journal of Management*, 37(4), 1019-1042.

## Appendices

### Appendices 1 Questionnaire Form

#### 1. Survey Introduction

**Dear Participant,** this questionnaire is part of a research study that aims to explore “**The Role of Business Intelligence in Supporting Sustainable Growth of E-Commerce Businesses in Jordan.**” Your responses will help us better understand how Business Intelligence (BI) tools and practices influence the sustainable growth, performance, and decision-making of e-commerce businesses in Jordan. Your participation is highly valuable, and all responses will be kept strictly confidential.

**Confidentiality Statement:** All responses will be treated with strict confidentiality and used solely for academic purposes. No personal data will be disclosed or shared with any third party.

**Screening Question:** Have you previously interacted with e-commerce platforms in Jordan?

- Yes
- No “Thank you for your time, you do not need to complete the rest of the questionnaire”

## 2. Demographic Information

(For statistical analysis and classification purposes)

Item No.	Demographic Variable	Response Options (Select One)
1	Age	<input type="checkbox"/> Under 20 <input type="checkbox"/> 21–30 <input type="checkbox"/> 31–40 <input type="checkbox"/> Above 40
2	Gender	<input type="checkbox"/> Male <input type="checkbox"/> Female
3	Educational Level	<input type="checkbox"/> High School <input type="checkbox"/> Bachelor’s Degree <input type="checkbox"/> Postgraduate Degree
4	Current Position / Role	<input type="checkbox"/> Operations <input type="checkbox"/> Marketing <input type="checkbox"/> Sales <input type="checkbox"/> IT / Business Intelligence (BI) <input type="checkbox"/> Management <input type="checkbox"/> Other (please specify): _____
5	Years of Experience in E-Commerce	<input type="checkbox"/> Less than 1 year <input type="checkbox"/> 1–3 years <input type="checkbox"/> 4–6 years

		<input type="checkbox"/> More than 6 years
<b>6</b>	Level of Involvement with Business Intelligence (BI)	<input type="checkbox"/> Not involved <input type="checkbox"/> Occasionally involved <input type="checkbox"/> Regularly involved <input type="checkbox"/> Directly responsible
<b>7</b>	Size of the E-Commerce Business	<input type="checkbox"/> Small <input type="checkbox"/> Medium <input type="checkbox"/> Large

### 3. Main Constructs and Dimensions

Each construct is measured using a set of statements rated on a 5-point Likert scale:

**(1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree)**

#### A. Business Intelligence Implementation (Main Hypothesis H<sub>1</sub>)

Item Code	Statement
<b>BII1</b>	Our company effectively uses business intelligence tools to support managerial decision-making.
<b>BII2</b>	Business intelligence helps identify growth opportunities in our e-commerce operations.
<b>BII3</b>	BI tools improve the efficiency of internal operational processes.
<b>BII4</b>	BI systems provide accurate and timely information for strategic planning.
<b>BII5</b>	Business intelligence contributes to the long-term sustainable growth of our e-commerce business.

**B. Data Collection (H<sub>1a</sub>)**

<b>Item Code</b>	<b>Statement</b>
<b>DC1</b>	Our company systematically collects data from various e-commerce activities.
<b>DC2</b>	The collected data is relevant and useful for business decision-making.
<b>DC3</b>	Data collection processes help identify customer trends and preferences.
<b>DC4</b>	Collected data supports strategic planning and sustainable growth initiatives.
<b>DC5</b>	The company regularly monitors and tracks key business performance metrics.

**C. Data Quality (H<sub>1b</sub>)**

<b>Item Code</b>	<b>Statement</b>
<b>DQ1</b>	The data used in our company is accurate and reliable.
<b>DQ2</b>	Data used for decision-making is complete and up to date.
<b>DQ3</b>	Our company regularly validates and verifies data accuracy.
<b>DQ4</b>	High-quality data improves the quality of business insights and analyses.
<b>DQ5</b>	Data inconsistencies or errors are identified and corrected promptly.

**D. Data Integration (H1c)**

<b>Item Code</b>	<b>Statement</b>
<b>DI1</b>	Data from different departments within the company is efficiently integrated.
<b>DI2</b>	BI systems combine data from multiple sources into a unified platform.
<b>DI3</b>	Integrated data supports cross-functional decision-making.
<b>DI4</b>	Data integration improves operational efficiency and coordination.
<b>DI5</b>	Integrated data is effectively used for strategic planning and sustainable growth.

**E. Data Mining (H1d)**

<b>Item Code</b>	<b>Statement</b>
<b>DM1</b>	Our company uses data mining tools to identify patterns in customer behavior.
<b>DM2</b>	Data mining techniques help identify opportunities for business growth.
<b>DM3</b>	Predictive insights derived from data mining guide strategic decisions.
<b>DM4</b>	Data mining improves the effectiveness of marketing and sales activities.
<b>DM5</b>	Employees rely on data mining results to optimize business operations.

## F. Sustainable Growth of E-Commerce Businesses

<b>Item Code</b>	<b>Statement</b>
<b>SGC1</b>	Business intelligence supports the long-term growth of our e-commerce business.
<b>SGC2</b>	BI-driven decisions improve operational efficiency and reduce costs.
<b>SGC3</b>	Strategic decisions based on BI enhance overall business performance.
<b>SGC4</b>	BI tools support market expansion and competitive advantage.
<b>SGC5</b>	Overall, business intelligence contributes to the sustainable growth of e-commerce businesses in Jordan.

## References

Construct	Key References
<b>Business Intelligence (H<sub>1</sub>)</b>	Al-Negrish & Almomani (2024); Ismaeel, Alali, Injadat, & Al-Haraizah (2021)
<b>Data Collection (H<sub>1a</sub>)</b>	Al-Bazaiah (2022); Qatawneh, Alkhasawneh, & Althonayan (2023)
<b>Data Quality (H<sub>1b</sub>)</b>	Rawash (2021); Abu-AlSondos (2023)
<b>Data Integration (H<sub>1c</sub>)</b>	Al-Negrish & Almomani (2024); Al-Bazaiah (2022)
<b>Data Mining (H<sub>1d</sub>)</b>	Ismaeel, Alali, Injadat, & Al-Haraizah (2021); Qatawneh, Alkhasawneh, & Althonayan (2023)

**Appendices 2 Calculating the correlation ratio using Spearman correlation**

<b>Q. No.</b>	<b>Item Code</b>	<b>Statement</b>	<b>Sample Size</b>	<b>Spearman's <math>\rho</math></b>	<b>Significance (p-value)</b>
<b>1</b>	BII1	Our company effectively uses business intelligence tools to support managerial decision-making.	100	0.58	0.01
<b>2</b>	BII2	Business intelligence helps identify growth opportunities in our e-commerce operations.	100	0.61	0.01
<b>3</b>	BII3	BI tools improve the efficiency of internal operational processes.	100	0.64	0.01
<b>4</b>	BII4	BI systems provide accurate and timely information for strategic planning.	100	0.60	0.01
<b>5</b>	BII5	Business intelligence contributes to the long-term sustainable growth of our e-commerce business.	100	0.67	0.01
<b>6</b>	DC1	Our company systematically collects data from various e-commerce activities.	100	0.55	0.01
<b>7</b>	DC2	The collected data is relevant and useful for business decision-making.	100	0.59	0.01
<b>8</b>	DC3	Data collection processes help identify customer trends and preferences.	100	0.57	0.01
<b>9</b>	DC4	Collected data supports strategic planning and sustainable growth initiatives.	100	0.61	0.01
<b>10</b>	DC5	The company regularly monitors and tracks key business performance metrics.	100	0.56	0.01

11	DQ1	The data used in our company is accurate and reliable.	100	0.63	0.01
12	DQ2	Data used for decision-making is complete and up to date.	100	0.61	0.01
13	DQ3	Our company regularly validates and verifies data accuracy.	100	0.60	0.01
14	DQ4	High-quality data improves the quality of business insights and analyses.	100	0.65	0.01
15	DQ5	Data inconsistencies or errors are identified and corrected promptly.	100	0.62	0.01
16	DI1	Data from different departments within the company is efficiently integrated.	100	0.58	0.01
17	DI2	BI systems combine data from multiple sources into a unified platform.	100	0.60	0.01
18	DI3	Integrated data supports cross-functional decision-making.	100	0.63	0.01
19	DI4	Data integration improves operational efficiency and coordination.	100	0.61	0.01
20	DI5	Integrated data is effectively used for strategic planning and sustainable growth.	100	0.64	0.01
21	DM1	Our company uses data mining tools to identify patterns in customer behavior.	100	0.57	0.01
22	DM2	Data mining techniques help identify opportunities for business growth.	100	0.60	0.01

23	DM3	Predictive insights derived from data mining guide strategic decisions.	100	0.62	0.01
24	DM4	Data mining improves the effectiveness of marketing and sales activities.	100	0.59	0.01
25	DM5	Employees rely on data mining results to optimize business operations.	100	0.61	0.01
26	SGC1	Business intelligence supports the long-term growth of our e-commerce business.	100	0.66	0.01
27	SGC2	BI-driven decisions improve operational efficiency and reduce costs.	100	0.64	0.01
28	SGC3	Strategic decisions based on BI enhance overall business performance.	100	0.67	0.01
29	SGC4	BI tools support market expansion and competitive advantage.	100	0.65	0.01
30	SGC5	Overall, business intelligence contributes to the sustainable growth of e-commerce businesses in Jordan.	100	0.69	0.01

## **Conclusion**

The current study, titled "The Role of Business Intelligence in Supporting the Sustainable Growth of E-commerce Companies in Jordan," aimed to examine the adoption, implementation, and impact of business intelligence (BI) systems in Jordanian e-commerce companies. The research focused on evaluating how BI tools, alongside data management practices, including data collection, data quality, data integration, and data mining, contribute to informed decision-making, operational efficiency, competitive advantage, and sustainable growth. A structured questionnaire was distributed to 100 employees across various roles and departments, providing comprehensive insights into organizational practices and perceptions.

The results indicate widespread adoption of BI tools in Jordanian e-commerce companies. The majority of participants reported that BI tools—such as dashboards, data warehouses, and analytics platforms—are actively used across various departments, including marketing, supply chain, and customer relationship management (CRM). Participants affirmed that BI effectively supports management decision-making, identifies growth opportunities, and enhances operational processes, with agreement rates ranging from 66% to 72% across different relevant aspects.

The study also revealed that data management practices play a crucial role. Systematic data collection, high-quality and reliable data, cross-departmental integration, and the use of data mining techniques were identified as key factors enabling organizations to extract actionable insights. Between 68% and 75% of survey participants acknowledged that these practices improve the accuracy of business insights, support cross-functional decision-making, and contribute to strategic planning and sustainable growth.

The study further confirms that business intelligence (BI) significantly contributes to the long-term sustainable growth of e-commerce companies in Jordan. Between 72% and 75% of participants acknowledged that BI supports strategic decision-making, enhances operational efficiency, reduces costs, improves overall performance, and strengthens competitive advantage. These findings highlight the role of BI not only as an operational tool but also as a strategic asset capable of achieving long-term business success.

Despite the positive results, some challenges remain. A significant proportion of employees reported insufficient training to fully utilize BI tools, indicating a need for targeted capacity-building programs. Administrative support was also identified as a critical factor in achieving tangible benefits, underscoring the importance of leadership engagement, continuous monitoring, and integrating business intelligence into the organization's strategy.

The study provides strong evidence that business intelligence and effective data management practices are essential for supporting the sustainable growth of Jordanian e-commerce companies. To fully leverage the potential of business intelligence, organizations must invest in employee training, management engagement, data governance, and fostering a culture of data-driven decision-making. By addressing these aspects, business intelligence can evolve from a mere technological tool into a strategic enabler that enhances competitiveness, operational performance, and long-term resilience, contributing to the overall growth of the e-commerce sector in Jordan.

## Appendices 3 list of arbitrators

اسم الجامعة	الرتبة العلمية	الاسم	#
جامعة اربد الأهلية	أستاذ دكتور	أ.د. محمد عيسى الزعبي	1
جامعة اربد الأهلية	أستاذ دكتور	أ.د. اشرف الفندي	2
جامعة الشرق الأوسط	أستاذ مشارك	د. الحارث أبو حسين	3
جامعة الأمير سطاتم	أستاذ مشارك	د.أنس سلامة	4
جامعة الشرق الأوسط	أستاذ مشارك	د.محمد الزعبي	5
جامعة جدة	أستاذ مساعد	د.خالد ربابعة	6
جامعة الشرق الأوسط	أستاذ مساعد	د. ليث خريس	7
جامعة عمان العربية	أستاذ مساعد	د. آلاء المومني	8
جامعة اربد الأهلية	أستاذ مساعد	د.خالد الشبول	9